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BULLETIN OF THE RESEARCH COUNCIL OF ISRAEL

Section B ZOOLOGY

Bull. Res. Counc. of Israel. B. Zoology

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MIRIAM BALABAN
Editor

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THE SIPUNCULIDS OF HAIFA BAY AND NEIGHBOURHOOD

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Royal Scottish Museum, Edinburgh

ABSTRACT

This account of the Sipunculids of Haifa Bay is based on collections from fourteen stations.

Seven species were secured and of these *Onchnesoma squamatum* was recorded for the first time from the Eastern Mediterranean. All specimens were small or even minute, a fact already noted by previous authors for other classes of animals from the area.

Whether this is a dwarf population or the area merely one where larval settlements do not grow to maturity is left undecided.

1. INTRODUCTION AND TABLE OF STATIONS

This account concerns mainly the collection made with grab and dredge in Haifa Bay between August 1953 and September 1955 by the staff of the Sea Fisheries Research Station, Haifa. For the privilege of examining it I am indebted to Mr. E. Gottlieb, Haifa. A second collection from two stations at Caesarea and Tel Aviv, containing two specimens taken by Dr. A. Wirszubski and sent for examination by Professor K. Reich, The Hebrew University of Jerusalem, was sent to me by Mr. N. Tebble, British Museum (Natural History), London. I have appended the particulars of this collection to the main account.

Fourteen stations were examined in Haifa Bay and their particulars are given in Table I, except that the nature of the bottom is not indicated. This is shown in the table of occurrences for the various species, since at most of the stations it seems to vary greatly and no comprehensive entry is possible. Sipunculids were secured at 13 of these stations.

2. SPECIES TAKEN

The following seven species were secured:

Sipunculus nudus Linnaeus.
Golfingia (*Phascolosoma*) *vulgare* (de Blainville).
Golfingia (*Phascolosoma*) *elongatum* (Keferstein).
Phascolosoma (*Physcosoma*) *granulatum* (Leuckart).
Aspidosiphon mülleri Diesing.
Onchnesoma steenstrupi Koren et Danielssen.
Onchnesoma squamatum Koren et Danielssen.

Received June 14, 1956.

All these species, with the exception of *O. squamatum*, have already been recorded from the area or from the middle Mediterranean.

A point of interest is the small size of most of the species, the individuals being very much under the normal length met with in other areas. Whether this dwarf population is caused by the physical conditions in the area or by the fact that only young individuals were taken is uncertain, but the presence of dwarf populations of other phyla have already been reported from the area. Mr. E. Gottlieb informs me that large specimens of *P. granulatum* are obtained from the rocky areas in the neighbourhood.

TABLE I

Stations in Haifa Bay, etc.

Station	Latitude	Longitude
1	32° 51' 17" N	35° 0' 0" E
2	32° 53' 36" N	35° 1' 0" E
3	32° 52' 42" N	34° 59' 0" E
4	32° 52' 54" N	34° 56' 36" E
5	32° 53' 12" N	34° 54' 36" E
6	32° 55' 18" N	34° 54' 12" E
7	32° 55' 30" N	34° 57' 0" E
8	32° 55' 30" N	35° 0' 42" E
9	32° 58' 0" N	34° 58' 36" E
10	32° 58' 0" N	34° 55' 18" E
11	33° 1' 6" N	34° 56' 36" E
12	33° 2' 0" N	34° 58' 18" E
13	33° 1' 6" N	35° 3' 30" E
14	32° 53' 6" N	35° 2' 12" E

TABLE II

Stations at which each species was taken and the number of hauls in which it occurred. The figure in brackets shows the total number of individuals secured at each station

Station No.	*S. nudus*	*G. vulgare*	*G. elongatum*	*P. granulatum*	*A. mülleri*	*O. steenstrupi*	*O. squamatum*	No. of times sampled
1	—	—	—	4 (65)	1 (1)	—	—	27
2	—	1 (1)	—	4 (16)	3 (18)	—	—	16
3	—	—	—	1 (1)	—	—	—	21
4	1 (1)	1 (1)	—	—	2 (7)	2 (2)	—	22
5	—	3 (3)	2 (3)	—	2 (2)	6 (9)	1 (1)	20
6	—	6 (13)	2 (5)	—	—	7 (10)	1 (1)	21
7	—	—	—	1 (1)	1 (1)	5 (6)	—	22
8	—	1 (3)	—	3 (4)	2 (3)	1 (1)	—	18
9	—	—	1 (1)	1 (1)	1 (12)	3 (4)	—	20
10	—	4 (6)	2 (5)	—	—	2 (2)	—	15
11	—	3 (4)	1 (2)	—	—	—	—	9
12	—	3 (4)	4 (11)	—	—	1 (3)	—	14
13	—	—	—	—	—	—	—	1
14	—	1 (7)	2 (7)	2 (3)	1 (2)	1 (2)	1 (1)	16

3. FREQUENCY AND RELATIVE ABUNDANCE OF THE SPECIES

On these grounds, as has so often been found elsewhere, Sipunculids are not very numerous, as may be seen from Table II, which gives the number of successful hauls and total number of individuals taken at each station. Except for *G. vulgare* at Station 6 and *O. steenstrupi* at Stations 6 and 7, the various species occurred in less than a quarter of the hauls. Neither were individuals generally very abundant. Except in a very few cases, such as *P. granulatum* at stations 1 and 2 and *A. mülleri* at station 2, only one or two individuals were secured at one time.

4. DETAILED DISTRIBUTION AND NOTES ON SPECIES

Sipunculus nudus L.

Station No.	Sample No.	Date	Depth in fths.
4	261	18.8.55	20

Only one small specimen 20 mm in length and almost fully extended was secured. This species is widely distributed in the Atlantic Ocean, Mediterranean, Indian Indian and Pacific Oceans.

Golfingia vulgare (de Blainville)

Station No.	Sample No.	Date	Depth in fths.	Nature of the bottom	Number of specimens per haul
2	132	7.9.54	15	rocks	1
4	55	23.8.53	27—28	mud	1
5	77	27.9.55	30	sand and mud	1
5	126	7.9.54	31	mud	1
5	192	5.4.55	27	gravel	1
6	76	27.9.53	42	mud	3
6	106	2.6.54	46	mud	3
6	182	24.1.55	40	mud	4
6	191	5.4.55	43	gravel	1
6	202	16.5.55	38	mud	1
6	264	18.8.55	40	mud	1
8	120	6.9.54	18.5	rocks	3
10	61	24.8.53	50	mud	1
10	123	6.9.54	40	mud	3
10	203	16.5.55	51	mud	1
10	275	19.8.55	55	mud	1
11	110	3.6.54	48	mud	1
11	254	2.8.55	48	mud	1
11	276	19.8.55	48	mud	2
12	79	28.9.53	35	mud	1
12	206	16.5.55	35	mud	1
12	278	19.8.55	31	mud	2
14	133	7.9.54	10	rocks and gravel	7

This species occurred in twenty-three of the samples, but was nowhere very abundant, the numbers per haul ranging from 1 to 4, except for a haul of 7 at Station 14.*

Again all specimens were very small, and in varying degrees of extension. The body length ranged from 1 to 7 mm but in only two was it over 5 mm.

The species has already been recorded from off Alexandria (Steuer 1936, p. 1; 1939, p. 1); off Tunisia (Wesenberg-Lund 1939, p. 18); elsewhere it is found on the Atlantic coasts of Europe, the Western Mediterranean, the Red Sea and the Indian Ocean.

Golfingia elongatum (Keferstein)

Station No.	Sample No.	Date	Depth in fths.	Nature of the bottom	Number of specimens per haul
5	77	27.9.53	30	sand and mud	2
5	173	23.1.55	30	gravel	1
6	124	6.9.54	38	mud	4
6	182	24.1.55	40	mud	1
9	60	24.8.53	28	mud	1
10	123	6.9.54	40	mud	4
10	203	16.5.55	51	mud	1
11	110	3.6.54	48	mud	2
12	109	3.6.54	35	mud	6
12	113	7.7.54	20	mud	3
12	205	16.5.55	35	mud	1
12	288	21.9.55	30	sand and mud	1
14	66	25.8.53	42	sand and mud	1
14	133	7.9.54	10	rocks and gravel	6
804	Caesarea	23.8.49	65 fths.		1
804a	Tel Aviv	21.8.49	26 fths.		

This species was taken in fourteen hauls but only in four were more than three taken, with six as the maximum.

Again the specimens were all very small, and in varying states of extension. The bodies measured from 2 to 11 mm, but only a few were between 5 and 11 mm. In some specimens the introvert, usually incomplete, was very long, reaching about 75 mm in length.

The species has already been recorded from off Alexandria (Steuer 1936, p. 4; 1939, p. 2). Further afield it is recorded from the northern North Sea, Skagerrak, Belgian Coast, Channel, and the coasts of France to the Mediterranean.

* In rocky areas only a part of them was collected.

Phascolosoma granulatum (Leuckart)

Station No.	Sample No.	Date	Depth in fths.	Nature of the bottom	Number of specimens per haul
1	71	27.9.53	10	rocks	6
1	98	2.6.54	12	rocks	26
1	135	7.9.54	13	rocks	20
1	195	11.4.55	13	rocks	13
2	132	7.9.54	15	rocks	1
2	155	11.10.54	14.5	rocks	11
2	273	18.8.55	15	rocks	1
2	298	27.9.55	15-16	rocks	3
3	245	29.7.55	16	rocks	1
7	226	7.6.55	21	rocks	1
8	120	6.9.54	18.5	rocks	1
8	169	30.11.54	17	rocks	2
8	229	7.6.55	18	rocks and gravel	1
9	257	2.8.55	23	rocks	1
14	145	10.10.54	10	rocks	2
14	281	19.8.55	10	rocks	1

This species appeared in sixteen hauls almost entirely from rocky ground. In three hauls at Station 1 numerous individuals were taken, the only example of a fairly good haul of these animals.

Practically all were contracted and comparatively small, considering the length these animals reach on other grounds. The body was under 30 mm in length in all hauls except haul 298, where the body-length of the three specimens was from 30-40 mm. The species has been recorded from several stations off Alexandria (Steuer 1936, p. 5; 1939, p. 2) and Caesarea (Wesenberg-Lund 1957, p. 194).

Further afield it occurs in the North Sea, the Atlantic coasts of Europe, into the Western Mediterranean, and through the Suez Canal to Zanzibar.

Aspidosiphon mülleri Diesing

Station No.	Sample No.	Date	Depth in fths.	Nature of the bottom	Number of specimens per haul
1	135	7.9.54	13	rocks	1
2	132	7.9.54	15	rocks	9
2	155	11.10.54	14.5	rocks	8
2	298	27.9.55	15-16	rocks	1
4	93	30.4.54	18	gravel	2
4	193	5.4.55	18	rocks	5
5	126	7.9.54	31	mud	1
5	142	10.10.54	32	mud	1
7	226	7.6.55	21	rocks	1
8	169	30.11.54	17	rocks	1
8	210	16.5.55	16	rocks	2
9	121	6.9.54	21-23	rocks and gravel	12
14	133	7.9.54	10	rocks and gravel	2

This species was taken in 13 hauls, but in numbers in only three of them. Again all individuals were very small. Most were contracted, the bodies being only 2–8 mm in length. So far as could be seen they had been living free and not, as is more often the case, in Gastropod or *Dentalium* shells.

The species has already been recorded from the area (Steuer 1936, p. 5; 1939, p. 2) and Caesarea (Wesenberg-Lund 1957, p. 197). Elsewhere it occurs in the North Sea, Skagerrak, North Atlantic, Mediterranean, Red Sea, Indian Ocean and the West African Coast.

Onchnesoma steenstrupi Kor. et Dan.

Station No.	Sample No.	Date	Depth in fths.	Nature of the bottom	Number of specimens per haul
4	55	23.8.53	27-28	mud	1
4	232	7.6.55	20	sand and rocks	1
5	77	27.9.53	30	sand and mud	1
5	126	7.9.54	31	mud	1
5	136	7.7.54	29	sand and mud	3
5	142	10.10.54	32	mud	1
5	199	16.5.55	30	sand and mud	1
5	233	7.6.55	27	sand amd nud	2
6	106	2.6.54	46	mud	1
6	107	2.6.54	38	gravel	1
6	124	6.9.54	38	mud	1
6	143	10.10.54	40	mud	3
6	191	5.4.55	43	gravel	1
6	201	16.5.55	38	mud	1
6	202	16.5.55	38	mud	2
7	75	27.9.53	21	sand and mud	1
7	117	8.7.54	20-21	sand and mud	2
7	150	11.10.54	21	sand and mud	1
7	189	5.4.55	21	sand and mud	1
7	249	2.8.55	21	sand and mud	1
8	270	18.8.55	18	sand and mud	1
9	149	11.10.54	23	sand and mud	2
9	166	30.11.54	23	sand and mud	1
9	256	2.8.55	23.5	gravel	1
10	81	28.9.53	55	mud	1
10	144	10.10.54	50	mud	1
12	113	7.7.54	20	mud	3
14	133	7.9.54	10	rocks and gravel	2
718 Tel Aviv		6.12.48	29.5 fths.		1

This was the commonest of all the species, occurring in 28 of the hauls, but was nowhere numerous, only 1–3 individuals being secured at one time. The specimens were in all stages of extension, but even so were rather small compared with those taken on other grounds. The bodies ranged from 1–2 mm in length and the introverts from 1½–6 mm in length. In only one case were the parallel lines on the introvert noted by Théel (1905, p. 95) clearly seen, and even then only one or two were sharply defined. This species is widely distributed in moderate depths along the coasts of Norway, Scotland, Ireland, France and Spain, and in the Mediterranean. It has already been recorded from Haifa Bay by Wiszubski (1953, p. 17).

Onchnesoma squamatum Kor. et Dan.

Station No.	Sample No.	Date	Depth in fths.	Nature of the bottom	Number of specimens per haul
5	127	7.9.54	27	gravel	1
6	263	18.8.55	30–31	mud	1
14	84	28.2.54	10	rocks	1

Three small specimens with bodies 2–4 mm in length were secured.

Their occurrence is interesting and is the first record of this species for the Eastern Mediterranean. It occurs in the Atlantic Ocean from the Lofotens to the coasts of Spain in moderate to fairly deep water, where it often occurs on the same grounds as *O. steenstrupi*. Again the specimens are rather small.

SUMMARY

This account deals mainly with the collections made at thirteen stations in Haifa Bay.

Seven species were recorded, *O. squamatum* being new to the area.

The species, with only one or two exceptions, were taken in under a quarter of the hauls. In practically all hauls only one or two individuals were taken at one time. As already noted for other phyla from the area the population seems to be a dwarf one.

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PYCNOGONIDA FROM THE MEDITERRANEAN COAST OF ISRAEL

J. H. Stock

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ABSTRACT

This is the first report on Pycnogonida from Israel's Mediterranean coast. The five species listed are: *Ammothella longioculata* Faraggiana, *Achelia echinata* Hodge, *Tanystylum orbiculare* Wilson, *Anoplodactylus saxatilis* Calman, and *A. portus* Calman. While the first three species are new to the Eastern Mediterranean, *Anoplodactylus saxatilis* was known only from the Indian Ocean and the Suez Canal. *A. portus* is a circumtropical species not yet recorded from the Mediterranean Sea.

A small collection of Pycnogonida from the Mediterranean shores of Israel, although containing but 5 species, proved to be of considerable interest. The only previous record of Pycnogonida in the Eastern Mediterranean is that of Helfer (1936) from Alexandria, Egypt.

Helfer mentions the following species: *Pallene brevirostris* Johnston, *Pallene spectrum* Dohrn, *Ammothea magnirostris* Dohrn and *Tanystylum conirostre* (Dohrn). His nomenclature, however, has become completely obsolete. Hence, in the following table I enumerate Helfer's species under the more modern names.

TABLE I

*Pycnogonida known from the Eastern Mediterranean**

CALLIPALLENIDAE

1. *Callipallene emaciata emaciata* (Dohrn) — H.
   A Mediterranean species (So. France, Naples, Alexandria).
2. *Callipallene emaciata spectrum* (Dohrn) — H.
   Known from the Atlantic and Mediterranean coasts of Europe, from Alexandria, and from the Black Sea.

AMMOTHEIDAE

3. *Ammothella longipes* (Hodge) — H.
   Known from the Atlantic and Mediterranean shores of Europe and North Africa.
4. *Ammothella longioculata* Faraggiana — S.
   Mediterranean (Ligurian Sea, Italy; Israel).

* H = species recorded by Helfer (1936).
S = species recorded by Stock (present paper).

Received February 20, 1957.

5. *Achelia echinata* Hodge — S.
The typical form of this species is widely distributed along the Atlantic and Mediterranean coasts of Europe and Africa; it has been found also in the West Indies.

6. *Tanystylum orbiculare* Wilson — H, S.
An amphi-Atlantic species, also known from Sydney, Australia. Common in the Mediterranean.

Phoxichilidiidae

7. *Anoplodactylus saxatilis* Calman — S.
A predominantly Indo-West Pacific species.

8. *Anoplodactylus portus* Calman — S.
A circumtropical species.

List of species

Ammothella longioculata Faraggiana

A. longioculata Faraggiana, 1940, pp. 9–10, figs. 1–3; Stock, 1954, p. 120 (in key).

Material: 2 males. Tantura, Israel. July 1953. Ch. Lewinsohn coll. 1 female. Same locality, same collector. July 1955.

Remarks: This species has been recorded only once before, from the Ligurian Sea, North-western Italy. It is very close to *A. longipes* (Hodge), a common Mediterranean and Atlantic species. In my opinion, it is not unprobable that *longipes* and *longioculata* are age stages of the same species. A similar situation is to be found in the two forms of *Ammothella appendiculata* (cf. Stock 1955, p. 251).

Achelia echinata Hodge

Material: 1 female. Tantura, Israel. July 1953. Ch. Lewinsohn coll.

Remarks: The sutures between the body segments are fairly indistinct in this specimen but otherwise it is indistinguishable from *A. echinata*. The species is new to the Eastern Mediterranean.

Tanystylum orbiculare Wilson

Principal lit.: cf. Stock 1954, p. 145.

Material: 3 females. Tantura, Israel. July 1955. Ch. Lewinsohn coll.

Remarks: Two different forms are provisionally included under the name *T. orbiculare*. In the one, represented by two females in the present collection, the abdomen is short (not reaching beyond the lateral processes of body segment 4), implanted on the boundary of body segments 2 and 3, and directed upward. I have seen material, apparently of the same species as these two specimens, from Naples, Farta Bay (West Africa), and the West Indies. This form is depicted clearly by Marcus (1940) under the name of *T. orbiculare*, and by Hedgpeth (1948) under the same name.

The other form is slightly larger, has a longer abdomne (extending to the middle of coxa 2 of leg 4), implanted at the posterior margin of body segment 3, and directed

more or less horizontally. In the Israeli material, there is one female specimen of this form. This specimen is moreover distinguished from the two other Israeli *Tanystylum* specimens by the much stronger development of the ovigers. This form is figured by Dohrn (1881) under the name of *Clotemia conirostris*.

Judging from the scant material at my disposal, the two forms are sibling species. Since, however, Dohrn (1881, p. 161, 162) and Schimkewitsch (1891, p. 521) mention considerable variations in the length and direction of the abdomen, it seems wise to mention only the two different forms in this paper, and to call the attention of other workers to this complex species.

The three possible explanations of the morphological divergence observed in the complex called "*Tanystylum orbiculare*" are: (1) Two sibling species are concerned (in this case, the types of *Tanystylum orbiculare* Wilson should be consulted, to see which of the two forms should actually bear the name *orbiculare*). (2) Two age stages of one species are concerned (a similar explanation has been given for the two forms existing in *Ammothella appendiculata*, cf. Stock 1955). (3) Merely incidental variations are concerned (variation in the length and the direction of the abdomen has been described in *Tanystylum neorhetum* by Gordon (1932, 1938, 1944) and by Stock (1954, 1955a).

Anoplodactylus saxatilis Calman

Material: 2 males. Tantura, Israel. July 1953. Ch. Lewinsohn coll.

Remarks: This species has been recorded at different occasions, but only the male sex (and occasionally *young* females) were ever found. The records came from a number of localities in the Indian Ocean: Mergui Archipelago (Calman 1923), Suez Canal (Calman 1927), Singapore (Stock 1954), Gulf of Manaar (Raj 1927).

Another species, *A. digitatus* (Böhm)*, has been found in the female sex only: Singapore (Böhm 1879), Kangeang Islands, Indonesia (Loman 1908), Madras (Calman 1923), Gulf of Manaar (Raj 1927), Paumben, India (Stock 1954), Martinique (Bourdillon 1955).

As Figures 1 and 2 show, the legs of *A. digitatus* and of *A. saxatilis* are very similar, as are the other structural details. The only difference between the two species is the presence of papillae on the proboscis of ♀ *digitatus*. In other species of the

* Through the courtesy of the Direction of the Zoological Museum, Berlin, I could examine Böhm's holotype, a female, of *A. digitatus*. It has distinct (although small) auxiliary claws and the proboscis possesses 4 rounded papillae on the ventral side.

As I could likewise check by examination of the original material, Loman's specimen of *A. digitatus*, from Siboga Station 15, is conspecific with Böhm's specimen, and has similar papillae on the proboscis.

It is clear that *A. investigatoris* Calman, 1923, is synonymous with *A. digitatus* (new synonymy!). *A. digitatus* shows a certain variation in the length of the femoral spur. The length of the 2nd coxa also varies: it is short on leg 1 and gradually longer on legs 2 to 4.

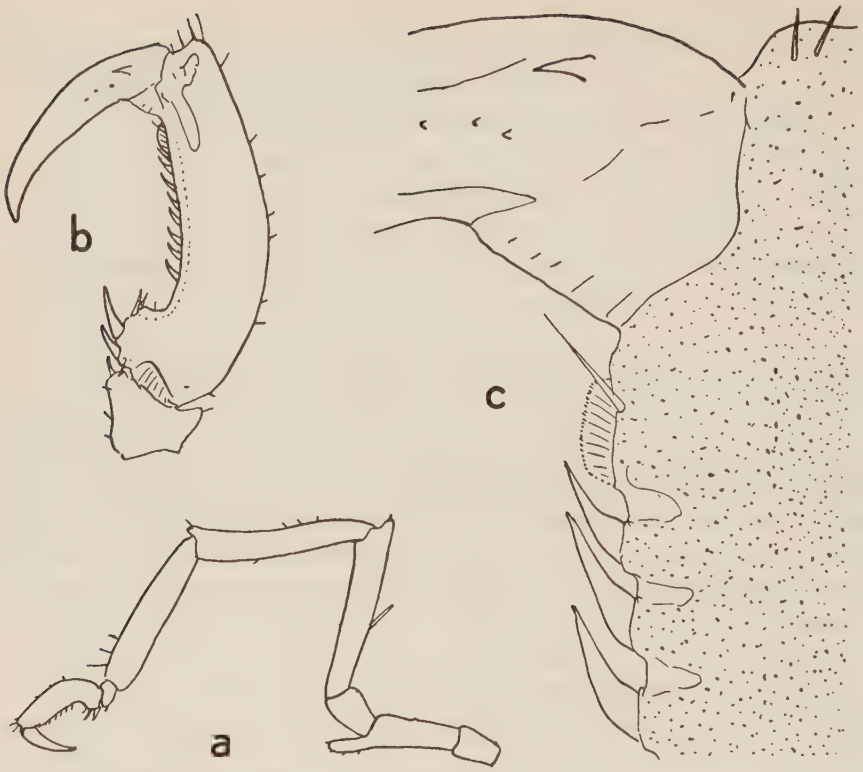

Figure 1

Anoplodactylus saxatilis Calman, male from Tantura, Israel.

a, Third leg; b, tarsus and propodus of the third leg; c, distal part of propodus further enlarged.

genus *Anoplodactylus*, however, we observe that the papillae on the proboscis occur in the female sex only. Consequently, I believe that in all probability *A. saxatilis* represents the male counterpart of the females described under the name of *A. digitatus*. But since *saxatilis* males have never been found together with *digitatus* (= *investigatoris*) females, it seems safe to delay synonymizing till males and females are found living side by side in one locality.

Anoplodactylus portus Calman

A. portus, Stock 1955, pp. 238–239 (lit., syn.).

A. carvalhoi, Bourdillon 1955, pp. 592–593, Pl. I, figs. 9–10 (measurements).

Material: 4 males, 1 female. Caesarea, Israel. Collected by A. Lederman - Klein at various dates: Nov. 10, 1951; Jan. 20, 1952; June 14, 1952. 8 specimens. Tantura, Israel. Collected by Ch. Lewinsohn, July 1953 and July 1955.

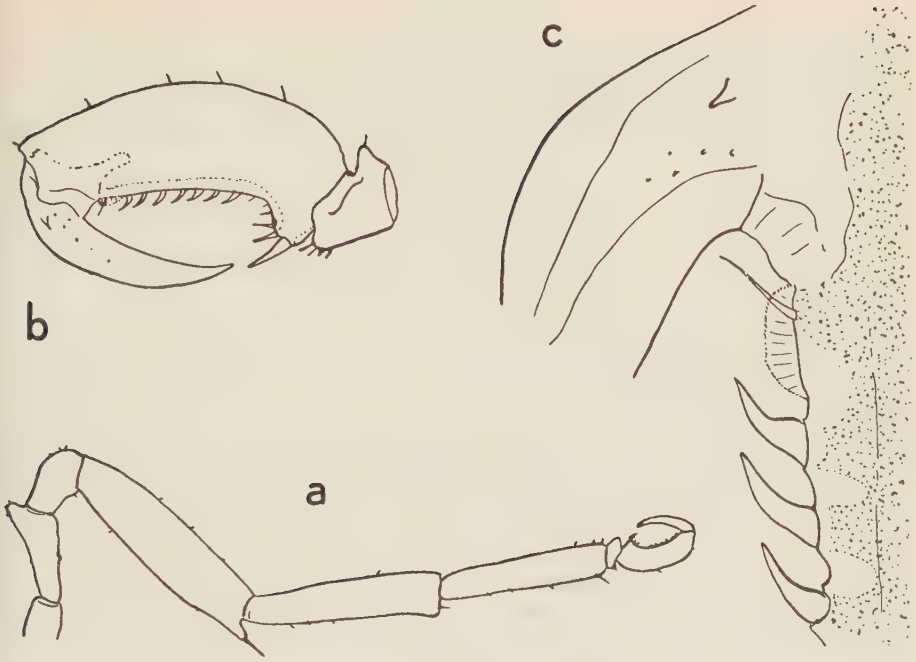

Figure 2

Anoplodactylus digitatus Böhm (= *investigatoris* Calman), female, from Paumben, India.
a, Third leg; b, tarsus and propodus of the third leg; c, distal part of propodus further enlarged.

Measurements, in mm:		♂ (Tantura)	♀ (Caesarea)
Total length (frontal margin cephalic segment to tip of abdomen)		2.2	2.3
Length of cephalic segment		0.81	0.98
Width across the 2nd lateral processes		1.4	1.3
Second leg :	coxa 1	0.27	0.23
	coxa 2	0.42	0.45
	coxa 3	0.33	0.38
	femur	1.35	1.71
	tibia 1	1.30	1.34
	tibia 2	1.13	1.38
	tarsus	0.08	0.11
	propodus	0.66	0.80

Remarks: The measurements of the Israeli specimens confirm my opinion as to the identity of *A. carvalhoi* Marcus and *A. portus* Calman (Stock 1955).

A. portus is a circumtropical species recorded from the Western Atlantic and from the entire Indo-Pacific, but it is new to the Mediterranean.

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ASCIDIES RECOLTEES SUR LES COTES MEDITERRANEENNES D'ISRAEL

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ABSTRACT

This is the first report on Tunicata from the Mediterranean coast of Israel. The twenty species listed are: *Eudistoma rubrum* (Savigny), *E. mucosum* (V. Drasche), *Cystodytes delle chiajei* (Della Valle), *Tridemnum fallax* (Lahille), *Lissoclinum batailloni* (Harant), *Diplosoma listerianum* (Milne-Edwards), *Ciona intestinalis* (L.), *Ascidia aspersa* Müller, *A. malaca* (Traustedt), *A. mentula* Müller, *A. cannelata* (Savigny-Oken), *Phallusia nigra* Savigny, *Perophora listeri* Wiegmann, *Microcosmus sulcatus* (Coquebert), *Herdmania momus* (Savigny), *Styela plicata* (Lesueur), *S. partita* (Stimpson), *Symplegma viride* Herdman, *Botryllus schlosseri* (Pallas), *Metrocarpa nigrum* (Herdman). Ten more species, collected otherwise in Israel waters, are mentioned in passing.

The list is doubtlessly incomplete as to the Ascidian fauna of Israel's Mediterranean coast. Particularly surprising is the absence of any Polyclinid species, since in several other areas of the Mediterranean Sea this family contributes more than 20% of the Ascidian fauna. Remarkable is the presence among the Palestinian Ascidians of several species recently immigrated from the Red Sea via the Suez Canal: *Herdmania momus*, *Ascidia cannelata*, *Phallusia nigra*, *Symplegma viride*. The same origin is probable for *Metrocarpa nigrum*.

J'ai reçu pour étude, en 1955, deux collections d'Ascidies provenant des côtes d'Israël. L'une réunie par E. Gottlieb (Sea Fisheries Research Station, à Haïfa) est encore en cours d'étude et ne renferme que du matériel de la Baie de Haïfa. L'autre réunie par le Dr. Steinitz fait l'objet de la présente publication. Elle comprend, d'une part, des spécimens de Césarée collectés par Madame A. Lederman-Klein, d'autre part, des échantillons collectés par des savants de l'Institut des Sciences Naturelles de Tel Aviv sur les côtes méditerranéennes d'Israël et étiquetés par les lettres N. S. suivies d'un numéro. Pour ces derniers échantillons, la station n'a pas été précisée. Le Dr. Steinitz m'a également adressé quelques spécimens de la Mer Rouge (Elath), que je laisse provisoirement de côté. La présente note est donc consacrée uniquement aux espèces méditerranéennes.

Les Ascidies méditerranéennes réunies par le Dr. Steinitz appartiennent à 20 espèces dont la liste s'établit comme suit:

POLYCYTORIDAE

Eudistoma rubrum (Savigny)
Eudistoma mucosum (v. Drasche)
Cystodytes delle-chiajei (Della Valle)

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DIDEMNIDAE

Tridemnum fallax (Lahille)
Lissoclinum batailloni Harant
Diplosoma listerianum (Milne-Edwards)

CIONIDAE

Ciona intestinalis (Linné)

ASCIDIIDAE

Ascidia espersa Müller
Ascidia malaca (Traustedt)
Ascidia mentula Müller
Ascidia cannelata (Savigny-Oken)
Phallusia nigra Savigny

PEROPHORIDAE

Perophora listeri Wiegmann

PYURIDAE

Microcosmus sulcatus (Coquebert)
Herdmania momus (Savigny)

STYELIDAE

Styela plicata (Lesueur)
Styela partita (Stimpson)
Symplegma viride Herdman

BOTRYLLIDAE

Botryllus schlosseri (Pallas)
Metrocarpa nigrum (Herdman)

Bien que mon travail sur la collection réunie en Baie de Haïfa par E. Gottlieb ne soit pas encore achevé, je dispose cependant dès maintenant d'éléments suffisants pour indiquer qu'à la liste précédente, on peut, pour les côtes méditerranéennes d'Israël, ajouter au moins les espèces suivantes:

POLYCITORIDAE

Tridemnum tenerum (Verrill)
Didemnum fulgens (Milne-Edwards)
Didemnum candidum (Sav.) f. *lahillei* (Hartmeyer)
Polysyncraton lacazei (Giard)

CIONIDAE

Rhopalopsis hartmeyeri Salfi
Rhopalaea neapolitana (Philippi)

ASCIDIIDAE

Ascidiella pellucida (Alder et Hancock)

PYURIDAE

Halocynthia papillosa (Linné)

Heterostigma separ Arnbäck Christie-Linde var. **mediterraneum** var. nov.

STYELIDAE

Polycarpa fibrosa (Stimpson)

Ces 10 espèces de la Baie de Haïfa portent donc à 30 le total des espèces connues des côtes méditerranéennes d'Israël.

Cette liste est évidemment incomplète mais elle appelle cependant deux remarques essentielles.

La première est l'absence totale de *Polyclinidae* alors que cette famille représente généralement en Méditerranée une fraction importante de la faune des Ascidies. Par exemple, sur les côtes de la France continentale (c'est-à-dire la Corse exceptée) et en tenant compte exclusivement des espèces que j'ai personnellement étudiées il y a 16 *Polyclinidae* sur un total de 65 espèces soit 24,6%.

Dans les parages du seuil siculo-tunisien, dont j'ai récemment étudié la faune (Peres 1956a), j'ai relevé 14 *Polyclinidae* sur 63 espèces, soit 22,2%. Je n'ai malheureusement pas encore achevé l'étude des Ascidies que j'ai récoltées en 1955 avec la "Calypso" en Mer Egée, mais, même d'après les relevés partiels, j'ai déjà 17,8% de *Polyclinidae* (5 espèces sur 28). A titre d'hypothèse et jusqu'à plus ample informé, on pourrait imputer cette absence de *Polyclinidae* sur les côtes d'Israël à la baisse de salinité épisodique de cette aire maritime en rapport avec les crues périodiques du Nil. La plupart des *Polyclinidae* et singulièrement les espèces méditerranéennes paraissent en effet assez nettement sténohalines.

La seconde remarque est la présence sur les côtes d'Israël d'espèces de caractère subtropical net et qui sont indiscutablement issues de la Mer Rouge. J'ai dans une publication récente, encore sous presse (Peres 1956b), cité le cas de la *Pyuridae Herdmania momus* qui paraît extraordinairement abondante sur toutes les côtes d'Israël, notamment dans les peuplements de *Caulerpa scalpelliformis*.

On peut y ajouter trois autres espèces: *Ascidia cannelata*, *Phallusia nigra*, *Symplegma viride*. Il me paraît à peu près certain que ces quatre espèces, que je n'ai jamais rencontrées ailleurs en Méditerranée, sont d'introduction récente dans cette mer et que cette introduction a été rendue possible par la baisse de salinité des Lacs Amers. C'est intentionnellement que je n'ai pas fait figurer dans cette liste *Metrocarpa nigrum* qui est connue également de la Mer Rouge mais que j'ai récoltée récemment sur les côtes orientales de Tunisie (Peres 1954).

Il se peut que les spécimens de cette espèce que l'on trouve sur les côtes d'Israël soient issus des peuplements de *Metrocarpa nigrum* du Golfe de Suez; la chose est même probable. Cependant la présence de cette espèce dans une autre partie du bassin oriental, où existent d'ailleurs d'autres formes sénégaliennes telle par exemple *Eudistoma paesslerioides*, fait qu'on doit, au moins pour les stations tunisiennes, la considérer comme relicte et qu'il m'a paru préférable de la laisser à l'écart de la liste des Ascidies de Mer Rouge récemment entrées en Méditerranée.

Eudistoma rubrum (Savigny)

Caesarea — I.VII.1951 — N° 62.

Je rapporte à *Eudistoma rubrum* (Sav.) un assez volumineux cormus (20 mm × 15 mm sur 5–7 mm d'épaisseur) de couleur améthyste. La tunique, relativement ferme, est nue, mais garnie de nombreuses fèces sableuses.

Les zoïdes, malheureusement en très mauvais état de conservation, sont très contractés et ne dépassent pas 2 mm de long. Les filets tentaculaires sont peu nombreux (12–18) et la branchie présente trois rangées de trémas longs et étroits, peu nombreux (10 au maximum par demi-rangée, et le plus souvent 7–8 seulement). Les gonades sont malheureusement inutilisables pour la détermination, la phase de reproduction sexuée étant déjà dépassée; quelques larves incubées sont encore présentes.

Par la pigmentation de la tunique (qui constitue un caractère assez important chez les *Eudistoma*), ce cormus d'Israël évoque assez *E. rabati* (Sluiter) des côtes du Maroc et *E. hepaticum* Van Name des Indes Occidentales. Mais ces deux espèces ont des zoïdes plus grands, des trémas plus nombreux et un nombre beaucoup plus élevé de filets tentaculaires.

C'est sur ces derniers caractères que je me suis fondé pour rattacher le gros cormus d'Israël à l'espèce de Savigny, dont j'ai déjà eu l'occasion d'étudier quelques spécimens et qui figure dans la clef dichotomique provisoire des *Eudistoma* de Méditerranée que j'ai donnée récemment (Peres 1956a). *E. rubrum* reste, malgré tout et en dépit de la petite monographie que lui a consacré Hartmeyer, une espèce mal connue.

Le gros cormus sommairement décrit ci-dessus était accompagné de quelques cormus beaucoup plus petits, nettement moins pigmentés.

Eudistoma mucosum (Von Drasche)

Caesarea — 2.VIII.1951 — N° 60.

Je rattache à *Eudistoma mucosum* (V. Dr.) un cormus à tunique très molle (la surface étant un peu plus ferme), renfermant des zoïdes très petits et tous immatures, présentant un pharynx à 3 rangs de trémas (à 6 par demi-rangée).

Cystodytes delle-chiajei (Della Valle)

Caesarea — 17.VIII.1952 — N° 21; 11.IX.1951 N° 59; XI.1952 — N° 5.

Il n'y a rien d'étonnant à retrouver ici (et en abondance) *Cystodytes delle-chiaje* qui est une des espèces les plus communes en Méditerranée en général et surtout dans le bassin oriental.

Tridemnum fallax (Lahille)

Caesarea — 17.VIII.1952 — N° 21.

Nombreux cormus, minces, de couleur brun-clair maculée de brun plus foncé, avec ilôts très visibles. La pigmentation est due à la présence dans la tunique commune de nombreuses cellules à granulations brunes. Les zoïdes eux-mêmes sont dépourvus de pigment. On voit bien les trois rangs de trémas et la position du siphon

cloacal, dirigé obliquement vers l'arrière, qui est habituelle chez les *Tridemnum*. Le spermiducte montre 6–7 tours de spire.

J'ai été frappé par le fait que les spicules des cormus de Césarée sont à sommets remarquablement nombreux et obtus; plus nombreux et plus obtus, en tous cas, que dans tous les cormus que j'ai étudiés jusqu'ici et notamment que chez les cormus récoltés à Augusta (Sicile) lors d'un des voyages de recherches de la Station Marine d'Endoume. Je ne pense pas qu'il faille accorder une grande valeur à ces fluctuations de la forme des sommets des spicules sauf, peut-être d'un point de vue statistique. Van Name (1945) en a figuré et signalé d'excellents exemples pour *T. savignyi* (Herdman) espèce que je considère comme synonyme de *T. tenerum* (Verrill) (Peres 1954, 1956a).

En ce qui concerne *T. fallax* (Lahille) d'une part, et *T. tenerum* (Verill)-*T. savignyi* (Herdman) d'autre part, je pense qu'il faut conserver les deux espèces distinctes. Lahille (1890) avait déjà reconnu que les spicules avaient des sommets plus obtus chez *T. fallax* que chez *T. tenerum*. Provisoirement je propose les critères de discrimination suivants entre ces deux espèces:

T. tenerum (= *T. savignyi*): Spicules à 25–30 sommets, en majorité (mais non toujours) assez épineux; spermiducte à 8–12 tours de spire.

T. fallax: Spicules à sommets nombreux (40–50), en majorité (mais non toujours) assez obtus; spermiducte à 6–7 tours.

Lissoclinum batailloni Harant

Caesarea — 17.VIII.1952 — N° 17 et N° 23.

Plusieurs cormus avec zoïdes bien typiques et spicules parfaitement conformes aux précisions que j'ai données récemment (Peres 1956a). Les individus sont tous immature et en pleine blastogénèse.

Diplosoma listerianum (Milne-Edwards)

Nombreux individus (dépourvus de pigment noir) N^{os} N. S. 278, N. S. 285, N. S. 286 (Méditerranée, sans précision de station).

Ciona intestinalis (Linné)

2 exemplaires: N^{os} N. S. 273, N. S. 275 (Méditerranée, sans précision de station).

Perophora listeri Wiegmann

Caesarea — 2.VIII.1951 — N° 60

Commun sur la tunique de diverses autres Ascidies; semble-t-il immature.

Ascidia aspersa O. F. Müller

Nombreux exemplaires: Caesarea — 17.VIII.1952 — N° 9; N. S. 278, 285, 289 (Méditerranée, sans précision de station).

Les exemplaires des côtes d'Israël que je rapporte à *Ascidia aspersa* O. F. Müller sont assez atypiques (surtout ceux étiquetés N. S. 278, 285, 289). J'ai déjà dit précédemment que je considère que la systématique du g. *Ascidia* en général et des espèces méditerranéennes en particulier, appelle de nouvelles recherches et une étude

critique approfondie des critères de discrimination des espèces. J'ai jusqu'ici suivi les principes adoptés par Harant (1931–1933) tout en sachant parfaitement qu'ils présentent, comme les autres systèmes proposés par divers auteurs, de graves inconvénients; quoiqu'il en soit, le système de Harant a au moins l'avantage d'être d'un emploi aisé et d'avoir été conçu pour les espèces de la région atlanto-méditerranéenne.

Tous les spécimens que j'ai rattachés à l'espèce *A. aspersa* ont une branchie à papilles principales bien développées mais sans papilles intermédiaires et un complexe neuro-glandulaire très voisin du ganglion nerveux; la forme du corps est généralement assez allongée. Ces spécimens sont atypiques en ceci que la distance intersiphonale y est nettement supérieure à ce qu'elle est d'habitude chez *A. aspersa* (entre 1/3 et 1/2 de la longueur totale); il en résulte que le point haut de l'anse intestinale dépasse l'anus et le siphon cloacal; le rectum est subvertical.

Ces échantillons ne peuvent évidemment être rapportés à *A. malaca* (Traustedt) dont le siphon buccal a une longueur caractéristique, non plus qu'à *A. obliqua* Alder de galbe large et plutôt ovalaire et qui est, de plus, une espèce nordique. Les proportions du corps et l'écartement des siphons les rapprochent de *A. mentula*, dont l'éloignent au contraire l'absence de papilles intermédiaires branchiales et la position du complexe neuro-glandulaire. C'est sur ces deux derniers critères auxquels, provisoirement j'attache une certaine valeur, que j'ai fondé ma détermination.

Ascidia mentula O. F. Müller

Caesarea — 2.VIII.1951 — N° 60 (6 exemplaires); 14.IX.1951 — N° 3 (2 exemplaires).

Tous ces spécimens ont une branchie bien typique avec des papilles intermédiaires le plus souvent très abondantes et, en tous cas, toujours présentes. Les individus d'août 1951 sont sexuellement mûrs; ceux de septembre de la même année sont immatures. Le galbe général du corps correspond généralement bien à celui qui est classique chez *A. mentula*, c'est-à-dire assez allongé et à siphons écartés. Seul un individu du lot N° 3 fait exception par sa forme courte. La plupart des spécimens du lot N° 60 sont nains (15 mm environ); un seul atteint 32 mm.

Ascidia malaca (Traustedt)

N. S. 288 (1 exemplaire) et 274 (plusieurs exemplaires) (Méditerranée sans précision de station).

J'ai basé ma détermination de ces échantillons principalement sur les trois caractères suivants: longueur et forme du siphon buccal, position assez postérieure du siphon cloacal, absence de papilles intermédiaires. La forme du tube digestif, assez typique dans l'exemplaire N. S. 288, l'est moins dans les spécimens N. S. 274, mais je pense que ce caractère (qui dépend assez largement de la façon dont les individus se sont contractés lors de la fixation) a une valeur restreinte quand les différences observées ne sont pas très accusées, ce qui est le cas.

Ascidia cannelata (Savigny-Oken)

N. S. 276 et 287 (Méditerranée, sans précision de station).

A. cannelata (Sav.–Oken), espèce de Mer Rouge bien étudiée par Hartmeyer (1915)

est pour la première fois récoltée en Méditerranée. Son acclimatation dans cette mer est sans doute bonne puisque les exemplaires sont sexuellement mûrs. L'exemplaire N° 276 est parfaitement typique à tous points de vue, et atteint 52 mm de longueur total. Le siphon cloacal est particulièrement développé et atteint presque l'extrémité du siphon buccal. Le pavillon cilié est en U irrégulier ouvert en avant et n'est pas particulièrement réduit.

Phallusia nigra Savigny

Caesarea — XI.1952 — N° 66 (2 exemplaires).

Phallusia nigra Savigny est, comme la précédente, une espèce de Mer Rouge, bien étudiée par Hartmeyer (1915) et qui est signalée pour la première fois en Méditerranée. Sur les deux exemplaires (taille 11 mm et 15 mm sans tunique) que j'ai eu en mains, l'absence de pavillon cilié principal, remplacé par de très nombreux pavillons secondaires, atteste l'appartenance au s/g *Phallusia*.

Si la tunique, non mamelonnée, est incolore et translucide, la masse viscérale est d'un brun foncé. La branchie montre des papilles principales volumineuses, obtuses, mais pas de papilles intermédiaires.

L'ensemble des caractères des exemplaires d'Israël cadre bien avec l'étude détaillée de Hartmeyer (1915). Il semble qu'aucune confusion ne soit possible avec les autres espèces de Phallusia qui seraient susceptibles de se rencontrer sur ces côtes. En effet *Ph. mamillata* (Cuvier) et *Ph. fumigata* (Grube) ont toutes deux des papilles intermédiaires. Quant à *Ph. arabica* Savigny elle présente une tunique fortement mamelonnée (comme celle de *Ph. mamillata* d'ailleurs) et surtout un rectum fortement dilaté en ampoule (qui est ébauché chez *Ph. fumigata*), caractères qui sont tous deux absents des spécimens d'Israël.

Herdmania momus (Savigny)

Herdmania momus, espèce de mer Rouge, nouvelle pour la Méditerranée, est extrêmement commune sur les côtes d'Israël. Elle figure dans la présente collection sous les N^{os} N. S. 281–282–283–284 (Méditerranée, sans précision de station) et je l'ai reçue en abondance de la Baie de Haïfa. L'espèce est bien acclimatée et on trouve de nombreux exemplaires avec des gonades mûres.

Microcosmus sulcatus (Coquebert)

Echantillons N. S. 271–272 (Méditerranée, sans précision de station).

Styela partita (Stimpson)

Styela partita (Stimpson) est très abondamment représentée dans la récolte des côtes d'Israël, où elle figure sous les N^{os} N. S. 274–275–276–277–278.

J'ai examiné ces spécimens avec une attention particulière car je voulais m'assurer qu'il ne s'agissait pas de *S. canopus* (Savigny) espèce très voisine de *S. partita* mais qui vit en Mer Rouge. En fait tout les exemplaires que j'ai étudiés étaient bien des *S. partita* caractérisés par la présence de 4–5 sinus longitudinaux au maximum

entre les plis branchiaux, alors qu'il y en a couramment 9–12 chez *S. canopus* d'après Hartmeyer (1915).

J'ai eu l'occasion de remarquer aussi que ces spécimens, appartenant indiscutablement à *S. partita* (ainsi que d'autres de Méditerranée occidentale), présentaient sur la tunique réfléchie des siphons les petites épines décrites par Michaelsen, lesquelles ne sont donc nullement caractéristiques de *S. canopus*.

Styela plicata (Lesueur)

Echantillons N. S. 279 et 280 (Méditerranée, sans précision de station).

Symplegma viride Herdman

Caesarea — 11.IX.1951 — N° 55 et XI.1952 — N° 65.

Symplegma viride Herdman est encore une espèce que l'on peut considérer comme récemment immigrée de la Mer Rouge, où elle est commune. L'état médiocre des spécimens ne m'a pas permis d'apprécier à laquelle des variétés reconnues par Michaelsen (1919) pour cette espèce ils appartiennent.

Botryllus schlosseri (Pallas)

Nombreux specimens : Caesarea — 23.VII.1951 — N° 63 (immatures). 2.VIII. 1951 — N° 60 (immatures). 17.VIII.1952 — N^{os} 5 et 20 et XI.1952 — N° 66 (sexuellement mûrs).

Metrocarpa nigrum (Herdman)

Caesarea — XI 1952 — N° 6.

Assez nombreux cormus, tous jeunes mais présentant déjà des systèmes méandriformes. Les individus sont immatures, mais leurs caractères anatomiques plaident en faveur de l'appartenance à *M. nigrum* (Herdman) plutôt qu'à *M. leachi* (Savigny). Les deux espèces sont d'ailleurs très proches.

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ASCIDIES DE LA BAIE DE HAIFA COLLECTEES PAR E. GOTTLIEB

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ABSTRACT

A study has been made of Ascidians collected in Haifa Bay by E. Gottlieb, comprising eighteen species. These, when added to another collection studied recently, raise the number of Israel Ascidians to 33 species distributed among nine families. The classification of the forms in the different families is discussed briefly, on the one hand as pertaining to the Mediterranean waters of the Near East in general and on the other with regard to the waters of the State of Israel. The chief characteristics of the latter group appear to be:

a) Extreme scarcity of *Polyclinidae*.

b) Absence of *Molgulidae*.

c) Presence of a rather important group of immigrant species from the Red Sea (*Ascidia cannelata, Phallusia nigra, Herdmania momus, Symplegma viride*).

Two new forms are described: *Rhopalopsis* (?) **orientalis** and the variety **mediterraneum** of the Arctic species *Heterostigma separ* Arnbäck-Christie-Linde.

I. PARTIE GENERALE

Récemment j'ai étudié (9) une petite collection d'Ascidies des côtes méditerranéennes de l'Etat d'Israël, collection réunie par le Dr. Steinitz. Presque simultanément j'ai reçu de M. E. Gottlieb un lot d'Ascidies provenant de la Baie de Haïfa et qui fait l'objet du présent travail.

La liste de cette dernière collection comprend 18 espèces qui se répartissent en 7 familles conformément à la liste ci-après.

Polycitoridae

Paradistoma cristallinum (Renier)
Cystodytes delle-chiajei (D. V.)

Didemnidae

Trididemnum tenerum (Verrill)
Didemnum candidum (Sav.) et f. *lahillei* (Hartm.)
Didemnum fulgens (Milne-Edw.)
Polysyncraton lacazei (Giard).

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POLYCLINIDAE

Amaroucium lobatum (Sav.).

CIONIDAE

Rhopalaea neapolitana (Phil.)
Rhopalopsis hartmeyeri Salfi.
Rhopalopsis **orientalis** sp. nov.
Ciona intestinalis (L.)

ASCIDIIDAE

Ascidiella pellucida (Ald. et Hanc.)
Ascidia aspersa Müller

PYURIDAE

Herdmania momus (Sav.)
Halocynthia papillosa (L.)
Heterostigma separ Arnbäck var. **mediterraneum** var. nov.

STYELIDAE

Styela plicata (Lessueur)
Polycarpa fibrosa (Stimpson).

En comparant la liste que j'ai fournie dans mon précédent travail[9] on constate que la faune des Ascidies des côtes méditerranéennes d'Israël comporte, dans l'état actuel des recherches, un total de 33 espèces se décomposant, comme suit, en 9 familles.

POLYCITORIDAE

Eudistoma rubrum (Savigny)
Eudistoma mucosum (v. Dr.)
Paradistoma cristallinum (Renier)
Cystodytes delle-chiajei (D. V.)

DIDEMNIDAE

Tridemnum tenerum (Verrill)
Tridemnum fallax (Lahille)
Didemnum candidum (Sav.) et f. *lahillei* (Hartm.)
Didemnum fulgens (Milne-Edw.)
Polysyncraton lacazei (Giard)
Lissoclinum batailloni Harant
Diplosoma listerianum (Milne-Edw.)

POLYCLINIDAE

Amaroucium lobatum (Sav.)

CIONADAE

Rhopalaea neapolitana (Phil.)
Rhopalopsis hartmeyeri Salfi
Rhopalopsis **orientalis** sp. nov.
Ciona intestinalis (L.)

ASCIDIIDAE

Ascidiella pellucida (Ald. et Hanc.)
Ascidia aspersa Müller
Ascidia malaca (Traustedt)
Ascidia mentula Müller
Ascidia cannelata (Savigny-Oken)
Phallusia nigra Sav.

PEROPHORIDAE

Perophora listeri Wiegmann

PYURIDAE

Microcosmus sulcatus (Coquebert)
Herdmania momus (Sav.)
Halocynthia papillosa (L.)
Heterostigma separ Arnbäck var. **mediterraneum** var. nov.

STYELIDAE

Styela plicata (Lesseur)
Styela partita (Stimpson)
Polycarpa fibrosa (Stimpson)
Symplegma viride (Herdman)

BOTRYLLIDAE

Botryllus schlosseri (Pallas)
Metrocarpa nigrum (Herdman

Certes on peut penser que cette liste n'est pas complète et que de nouvelles prospections contribuent à l'allonger quelque peu. Je pense cependant, par comparaison avec ce qu'on sait des faunes ascidiologiques d'autres aires de la Méditerranée, qu'elle donne une idée assez exacte du peuplement ascidiologique des côtes méditerranéennes d'Israël.

En tenant compte du travail encore inédit et incomplet que j'ai en cours sur les Ascidies de la Mer Egée (Campagnes Océanographiques 1955 et 1956 de la "Calypso") on peut faire quelques remarques préliminaires sur les peuplements des mers du Proche-Orient en général et sur les côtes d'Israël en particulier.

A. Peuplements des mers du Proche-Orient en général

Pour les familles des *Didemnidae*, *Ascididae*, *Pyuridae*, *Styelidae*, les différences faunistiques entre le bassin oriental et le bassin occidental sont minimes et les espèces récoltées sont sensiblement les mêmes, quoique leur abondance respective soit susceptible de varier légèrement, de l'un à l'autre, pour des biotopes comparables.

Pour la famille des *Polyclinidae* il y a un fond commun peu important et, d'une façon générale, il semble y avoir, surtout pour le g. *Amaroucium*, deux groupes d'espèces, l'un occidental, l'autre oriental. Pour un certain nombre d'espèces il y a localisation absolue dans l'un ou l'autre bassin, mais, dans la plupart des cas, les espèces abondantes dans l'un des bassins sont exceptionnelles dans l'autre. Du point de vue des *Polyclinidae* la région du seuil siculo-tunisien présente un mélange de formes occidentales et orientales (ces dernières plus nombreuses), ce qui est conforme aux conditions géographiques et océanographiques de cette aire maritime.

Pour la famille des *Polycitoridae* les grandes lignes de la distribution des espèces sont très comparables à celles que je viens d'indiquer pour les *Polyclinidae*. La plupart des espèces du g. *Eudistoma* paraissent plus orientales qu'occidentales et il en est de même des deux espèces méditerranéennes du g. *Paradistoma*.

Certaines espèces appartenant à diverses familles paraissent avoir un "statut" analogue à celui que je viens d'indiquer pour bon nombre de *Polyclinidae* et *Polycitoridae*, notamment *Clavelina della-vallei* (Zirpolo) (*Clavelinidae*) et *Rhopalopsis hartmeyeri* Salfi (*Diazonidae*).

La famille des *Molgulidae* présente un cas assez particulier en ceci qu'elle paraît s'appauvrir fortement d'Ouest en Est. Si l'on fait abstraction de la mer Adriatique (dont les *Molgulidae* exigent une révision) on constate qu'il y a 8 espèces connues dans le bassin occidental, 4 dans la région siculo-tunisienne, et une seulement (dans l'état actuel des recherches) en Mer Egée. Je ferai remarquer en passant qu'il n'existe, à ma connaissance qu'une seule espèce de *Molgulidae* en Mer Rouge.

B. Peuplement des côtes méditerranéennes de l'Etat d'Israel

Le peuplement des côtes méditerranéennes d'Israël me paraît, dans l'état actuel de nos connaissances, présenter trois caractéristiques essentielles.

a) Rareté extrême des *Polyclinidae*. Alors qu'en Mer Egée les *Polyclinidae* représentent de 15% à 20% du nombre total des espèces je n'ai relevé sur les côtes d'Israël que le seul *Amaroucium lobatum*; encore cette espèce était-elle représentée par trois zoïdes isolés. J'ai déjà dit précédement[9] que je crois devoir imputer cette particularité à la baisse de salinité épisodique quiaffecte les côtes d'Israël du fait de la crue annuelle du Nil. Il semble, en effet, que les *Polyclinidae* méditerranéennes (et notamment les formes qui dominent dans le bassin oriental) sont relativement sténohalines pour les salinités élevées. Je signalerai en passant que j'impute à la même cause l'absence sur les côtes d'Israël du g. *Pyura* (fam. des *Pyuridae*).

b) Absence de *Molgulidae*. J'ai dit plus haut que jusqu'ici je n'ai récolté qu'une seule espèce de *Molgulidae* dans les mers baignant le Proche-Orient (il s'agit de *Ctenicella appendiculata*). Sur les côtes méditerranéennes d'Israël cette espèce n'est même pas représentée et cette absence est d'autant plus significative que le plateau continental de ce pays est en grande partie formé de fonds meubles à grain fin qui constituent les biotopes de prédilection des espèces de cette famille.

c) Présence sur les côtes d'Israël d'espèces issues de la Mer Rouge. Dans ma note précédente j'ai mentionné quatre espèces (*Herdmania momus*, *Ascidia cannelata*, *Phallusia nigra*, *Symplegma viride*) de caractère subtropical net et qui paraissent indiscutablement issues de la Mer Rouge. Jusqu'ici je n'ai rencontré aucune de ces espèces dans une autre région de la Méditerranée orientale (pas même, à première vue du moins, dans les parages de Castellorizo et Rhodes où j'ai pu faire quelques prospections lors de la compagne 1956 de la "Calypso," non plus que sur les côtes de Syrie d'où j'ai eu quelques espèces récoltées par R. Amar). Il parait très probable que ces quatre espèces sont d'introduction récente en Méditerranée, introduction rendue possible par la baisse de salinité des Lacs Amers, et qu'elles n'ont pas encore eu le temps de s'étendre largement dans le bassin oriental; *Herdmania momus*, en particulier, est remarquablement abondante. La différence entre la répartition de ces espèces et celle de la Phanérogame marine *Halophila stipulacea* qui est, au contraire, largement répandue en Mer Egée apporte un argument en faveur de l'hypothèse que J. Picard et moi-même avons récemment formulée et suivant laquelle cette Phanérogame serait indigène (sans doute à titre de relicte) en Méditerranée orientale et non pas introduite vers la fin du XIXème siècle par le Canal de Suez[11].

Je rappellerai enfin que j'ai, dans ma note précédente[9], traité du cas particulier de *Metrocarpa nigrum*, autre espèce subtropicale, mais dont on ne peut affirmer qu'elle soit émigrée de Mer Rouge, étant donné que je l'ai récoltée également en Tunisie.

II. PARTIE SPECIALE

Paradistoma cristallinum (Renier)

Echantillons: 199, 229 et 255.

Stations: 5 (gravier vaseux), 8 (roche et graviers avec algues), 12 (vase).

Les cormus des trois provenances sont très comparables, en masse, petits et immatures. Les zoïdes sont généralement de petite taille (8–10 mm). La tunique est toujours consistante et le développement, souvent imparfait, des zoïdes indique que la phase de dégénérescence saisonnière dont j'ai parlé précédemment[7] a déjà eu lieu.

Une certaine incertitude subsiste avec *Paradistoma adriaticum* (Von Drasche) mais le fait que la tunique est dépourvue de taches bistres, et aussi le nombre assez restreint (14–15) de rangées de trémas chez les zoïdes paraissant bien développés

fait pencher la détermination vers *P. cristallinum* (Renier). Pour les critères distinctifs de ces deux espèces je renvoie à mon précédent travail[7].

L'espèce parait assez répandue dans tout le bassin oriental de la Méditerranée.

Cystodytes delle-chiajei (Della Valle)

Echantillons: 57, 71, 85, 191, 191B, 191G, 200, 263.

Stations: I (sable), 2 (roche avec algues), 5 (graviers vaseux), 6 (vase), 8 (roche et graviers avec algues).

Cystodytes delle-chiajei est très largement répandue dans la Baie de Haïfa, ainsi qu'il en est d'ailleurs, pratiquement, dans toute la Méditerranée.

Il est à noter que j'ai relevé sur l'échantillon 171 des amas localisés de très petits spicules aciculaires, rappelant tout à fait ceux de la forme *lahillei* du *Didemnum candidum*. Etant donnée la relative plasticité morphologique des formations de calcite à l'intérieur de l'espèce chez beaucoup d'Ascidies, je n'attribue aucune valeur taxonomique à cette particularité.

Tridemnum tenerum (Verrill)

Echantillons: 182, 191, 191C, 210, 241D, 314, 315.

Stations: 5 (graviers vaseux), 6 (vase), 8 (graviers et roche avec algues), 10 (vase).

Les conditions de fixations rendent très difficile (comme d'ailleurs celle de tous les *Didemnidae*) l'étude des échantillons que je crois pouvoir attribuer à *Tridemnum tenerum* (Verrill).

La plupart des cormus ne renferment que des zoïdes immatures. Le cormus 315 est en fin de maturité sexuelle. La spiculation est généralement dense à l'exception de l'échantillon 210 où les spicules sont peu nombreux et localisés surtout dans la couche moyenne. Les spicules sont typiques et montrent souvent, à l'intérieur d'un même cormus, les variations morphologiques signalées par Van Name[12].

La pigmentation est très variable. Certains cormus sont complètement dépourvus de pigment brun-noir; d'autres en montrent, mais diversement localisé: sur l'abdomen (210), en haut de l'endostyle (314), dans la tunique (191).

Je renvoie pour l'étude de cette espèce aux considérations que j'ai développées dans un précédent travail[5].

Didemnum candidum (Savigny)

Le lot d'échantillons qu'on peut, avec quelques réserves, attribuer à *Didemnum candidum* (Sav.) espèce très polymorphe se répartit nettement en deux groupes.

a) Les échantillons 241B (Station 5: graviers-vaseux) et 250B (Station 7: sable à *Caulerpa*) appartiennent indiscutablement à la forme *lahillei* (Hartm.) dont j'ai déjà dit précédemment[7] qu'elle ne peut être considérée comme une espèce valable. Dans les échatillons de la Baie de Haïfa les spicules sont bien typiques

(aciculaires) et localisés au voisinage immédiat des zoïdes. Il y a quelques individus sexuellement mûrs dans les échantillons 241B.

b) Les échantillons 196B (Station 13: roche avec algues), 257B (sable et graviers vaseux), 312 et 338 (graviers vaseux), 348 (sable), 315 (sable), sont de détermination assez douteuse. Ils sont tous immatures sauf ceux du N° 196B où on observe un spermiducte à 6–8 tours et quelques zoïdes du N° 315. Les spicules sont peu typiques; on trouve en proportion à peu près équivalentes des spicules à sommets assez aigus, bien dégagés les uns des autres et peu nombreux (une vingtaine), et des spicules à sommets mousses, plus nombreux (30–35), et de forme plus massive.

Il ne serait pas impossible qu'il y eût là une hybridation entre deux espèces, celles-ci étant sans doute, alors, *Didemnum fulgens* et *D. candidum* ou encore une race locale de l'une de ces deux espèces. Il faudrait pour résoudre la question des échantillons nombreux, et surtout frais, ou du moins parfaitement conservés.

Didemnum fulgens (Milne-Edwards)

Echantillon: 239 (Edwards).
Station: 12 (vase).

Didemnum fulgens, très commun dans toutes les aires de la Méditerranée que j'ai étudiées, paraît ici relativement rare à moins que les spécimens mentionnés ci-dessus à propos de *D. candidum* ne doivent y être rattachés.

Quoiqu'il en soit, l'échantillon N° 239 était, lui, parfaitement typique, aussi bien en ce qui concerne les spicules qu'en ce qui concerne le spermiducte. Le thorax des zoïdes était très pigmenté.

Polysyncraton lacazei (Giard)

Echantillons: 152B, 239B, 257, 346.
Stations: 4 (sable et graviers), 8 (graviers et roche avec algues), 9 (sable et graviers vaseux), 12 (vase).

La couleur des cormus est orangé-terne et les zoïdes sont bien pigmentés et présentent l'habituelle cavité péribranchiale évasée.

Il y a, comme cela est habituel, une zone de "clivage" facile dans le cormus entre la couche supérieure et la partie basale (incluant les abdomens). Il y a quelques zoïdes sexuellement mûrs; le spermiducte est indéchiffrable en raison des conditions de conservation, sauf dans le cormus 152B (Octobre 1954) dont les zoïdes sont bien mûrs.

Amaroucium lobatum (Savigny)

Echantillon: 98.
Station: 1 (sable).

La présence de *Amaroucium lobatum* dans la Baie de Haïfa aurait besoin d'être confirmée car j'ai eu à ma disposition, en tout et pour tout, trois zoïdes isolés sans

tunique. Ceux-ci étaient longs de 2–3 mm, de couleur brun-rouge, à postabdomen relativement court à 9 rangs de trémas. La languette cloacale persistant sur un des zoïdes est assez longue mais très mince, ce qui explique son inconstance. Les caractères de ces zoïdes étaient suffisamment nets pour que j'aie pu utiliser la clef dichotomique provisoire des *Amaroucium* de Méditerranée que j'ai publiée récemment.

Rhopalaea neapolitana Philippi

Echantillon: 233.

Station: 5.

Rhopalaea neapolitana n'est représentée dans la collection de la Baie de Haïfa que par un exemplaire très petit (12 mm) à tunique cartilagineuse et thorax de forme bien cylindrique montrant environ 15 range de trêmas. Il semble s'agir d'une forme naine plutôt que d'un individu jeune.

Rhopalopsis hartmeyeri Salfi

Echantillon: 202.

Station: 6 (vase).

Le rattachement à *Rhopalopsis hartmeyeri* est un peu incertain en raison de l'état déplorable de l'unique zoïde. Cependant la forme subtriangulaire du thorax et la consistance relativement faible de la tunique écartent nettement le spécimen en question de l'espèce *Rhopalaea neapolitana*. La présence chez *Rhopalopsis hartmeyeri* d'une embase tunicale commune aux divers zoïdes n'a pu être utilisée puisqu'il n'y avait qu'un zoïde.

Rhopalopsis (?) **orientalis** sp. nov. (Figure 1)

Echantillons: 195F, 233, 258, 339, 346.

Stations: 1 (sable), 5 (graviers vaseux), 8 (graviers et roche avec algues).

Cormus à tunique cartilagineuse, très consistante, blanchâtre, translucide, formée de digitations plus ou moins étranglées et contournées, pouvant atteindre 1 cm. de long et souvent unies à la base par une embase commune. Les zoïdes paraissent isolés chacun au sein d'une digitation. Lorsqu'ils se rétractent, deux zoïdes logés dans des digitations voisines peuvent se retrouver côte a côte dans l'embase commune.

Zoïdes opaques; longueur difficile à apprécier en raison de leur fragmentation au moment de la fixation (phénomène bien connu chez *Rhopalaea* et *Rhopalopsis*) mais sans doute de l'ordre de 5 mm. Siphon buccal à 6 lobes; quand le siphon est contracté ceux-ci apparaissent bifides et montrent une tache jaune-orangé au point de bifurcation et deux autres taches à l'extrémité de chacun des deux lobes. Quand le siphon est étalé on s'aperçoit que les lobes siphonaux sont très dilatés et frangés de prolongements (3 ou 4 par lobe) portant à l'extrémité de leur partie basale de petites taches pigmentaires jaune-orangé.

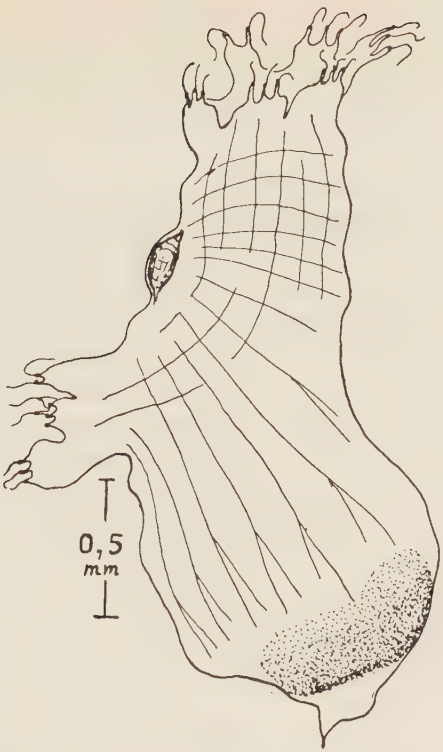

Figure 1
Rhopalopsis **orientalis** sp. nov.
Vue du thorax pour montrer la tache de pigment orangé postérieure et le détail des lobes siphonaux dentelés (très visibles au moins sur certains individus).

Le siphon cloacal, assez irrégulièrement lobé suivant les individus, montre de 4 à 6 lobes de même structure que ceux du siphon buccal.

Le thorax montre à sa base une large zone pigmentée en orangé vif, plus étalée du coté ventral. Il y a parfois un peu de pigment orangé au voisinage du ganglion nerveux, et on observe aussi des cellules hémolymphatiques à pigment orangé dans la branchie.

Le pharynx branchial est d'étude très difficile à cause de la contraction des individus. Il compte 11–12 rangées de trémas nombreux (au moins 20–25 par demi rangée). Sur tous les zoïdes on voit de fortes crêtes transversales qui paraissent être des sinus transverses aboutissant aux languettes de Lister du raphé dorsal. Sur certains zoïdes on voit, très difficilement et par places, des sinus longitudinaux très fins.

Le tube digestif présente une torsion incomplète et un estomac lisse de forme plutôt globuleuse.

Les gonades comportent un ovaire très réduit ne comportant qu'un petit nombre d'ovocytes et situé dans l'anse intestinale. La gonade mâle comporte une trentaine

d'acini testiculaires. Ceux-ci ne sont pas piriformes ni disposés en rosette, mais de forme très irrégulière, parfois sinueux et même bifurqués. La maturité sexuelle paraît se placer en avril: l'échantillon 191 (5.IV.55) renferme quelques oeufs fécondés alors que tous les autres spécimens, récoltés en février, juin et août ne montrent rien de pareil.

Remarques: L'état de conservation médiocre des échantillons a rendu très difficile l'étude de la branchie. J'ai longtemps hésité à faire de ces spécimens soit une Aplousobranche (à ranger alors dans le genre *Clavelina* ou dans un genre voisin), soit une Phlébobranche. Finalement j'ai adopté cette deuxième solution en raison des sinus transverses et longitudinaux (ceux-ci très fins) que je crois avoir reconnus sur certains échantillons favorables. Parmi les Phlébobranches on ne pouvait évidemment ranger l'espèce de Haïfa, puisqu'elle est "hypogone", que dans la famille des *Diazonidae*, et au voisinage des g. *Rhopalaea* et *Rhopalopsis*. La présence d'une embase tunicale commune à pluseiurs zoïdes m'a fait opter pour ce dernier genre. L'espèce *Rhopalopsis orientalis* de la Baie de Haïfa se distingue de *Rhopalopsis hartmeyeri* Salfi par son thorax régulièrement cylindrique (et non évasé), par sa pigmentation orangée, par le fait que la tunique est beaucoup plus consistante.

Accessoirement on peut faire remarquer que certains caractères confirment l'appartenance de l'espèce de Haïfa aux Phlébobranches, par exemple la présence des taches pigmentaires sur les lobes siphonaux, taches qui existent presque constamment chez les Ascidies de cet ordre.

Il serait très souhaitable que des exemplaires correctement fixés (et, si possible, anesthésiés au préalable) de cette espèce pussent être récoltés de façon à fournir un complément d'information sur son anatomie et quelques notions sur sa biologie, et notamment sur l'existence éventuelle de phénomènes de rajeunissement périodique des zoïdes après dégénérescence du thorax.

Ciona intestinalis (Linné)

Echantillon: 135.

Station: 1 (roche avec algues).

L'unique exemplaire de *Ciona intestinalis* figurant dans cette collection est un animal immature. Sa couleur est rougeâtre et la tunique paraît non rétractile, caractères qui appartiennent à *Ciona roulei* Lahille. Cependanti le specimens de Haïfa présente des caractères anatomiques qui sont ceux de *Ciona intestinalis*: sinus transverses de 3 ordres; présence de 6 faisceaux musculaires longitudinaux de chaque côté du corps (au lieu de 4 chez *Ciona roulei*); siphon cloacal ne paraissant pas plus long que le siphon buccal (tout au moins sur cet animal contracté); et c'est en me fondant sur ces caractères que je l'ai déterminé, d'autant que j'ai déja vu, à plusieurs reprises, des individus de *Ciona intestinalis* intensément pigmentés en rouge par suite d'une déviation de métabolisme (dont j'ignore les causes) amenant une hyperproduction de cellules à petits grains de mélanine rouge orangé.

En résumé et après avoir, en dix-sept années, étudié bien des exemplaires de *Ciona* je suis amené à émettre quelques doutes sur la valeur de *Ciona roulei* Lahille et même de *Ciona savignyi* Herdman, tant les critères qui séparent ces deux espèces me paraissent incertains et d'importance secondaire en face du polymorphisme de *Ciona intestinalis* (L.)

Ascidiella pellucida (Alder et Hancock)

Echantillons: 110, 149, 191D, 269, 279.

Station: 6 (vase); 8 (roche et graviers avec algues); 9 (sable et graviers vaseux); 11 et 12 (vase).

J'ai interprété l'espèce *Ascidiella pellucida* (Ald. et Hanc.) suivant la définition adoptée par Harant[2], c'est-à-dire que j'y ai inclu toutes les *Ascidia* dont la branchie est rigoureusement dépourvue de papilles. Les exemplaires observés sont en général immatures et tous (à l'exception de l'échantillon 269) sont frappés de nanisme. La tunique (lisse ou villeuse) et la pigmentation sont très variables, comme il est de règle chez cette espèce.

Ascidia aspersa Müller

Echantillon: 241.

Station: 5 (graviers vaseux).

Je n'ai trouvé de cette espèce qu'un seul exemplaire d'ailleurs dépouillé de sa tunique, de très petite taille (5 mm) et en très mauvais état. La branchie était conforme aux caractères adoptés par Harant[2], et montrait une pigmentation orangé dense.

Herdmania momus (Savigny)

Echantillons: 127, 152, 167, 209, 213, 241, 250, 267, 291, 292, 310, 332.

Stations: 1 (sable, très communes sur *Caulerpa scalpelliformis*, individus mûrs); 3 et 4 (sables et graviers); 5 (graviers vaseux souvent en amas sur des débris coquilliers); 7 (sable à *Caulerpa scalpelliformis*); 8 (roche et graviers avec algues); 9 (sable et graviers vaseux).

Dans deux notes précédentes encore sous-presse[9-10] j'ai attiré l'attention sur l'abondance le long des côtes d'Israël de cette espèce, sans aucun doute immigrée de la Mer Rouge et qui parait bien acclimatée. Les individus sont très nombreux, souvent groupés en bouquets et sur les supports les plus variés (*Caulerpa*, graviers, débris coquilliers, etc.).

Halocynthia papillosa (Linné)

Echantillon: 273.

Station: 2 (rochers et algues).

Heterostigma separ Arnbäck-Christie-Linde var. **mediterraneum** var. nov. (Figure 2)

Un unique exemplaire de petite taille (20 mm de haut) avec 8 plis branchiaux d'un coté et 9 de l'autre, gonades mûres (août 1955).

Echantillon: 197.

Station: 1 (sable).

J'ai d'abord pris ce petit échantillon de 1.5 mm de long, globuleux, et en assez mauvais état (notamment dans la région siphonale) pour une Molgule.

L'étude de la masse viscérale et notamment l'absence de rein m'a montré qu'il s'agissait d'une *Pyuridae* appartenant au g. *Heterostigma* Arnbäck 1924.

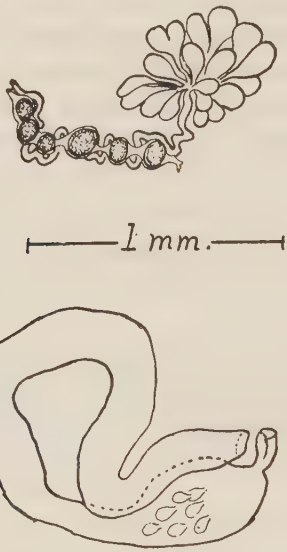

Figure 2

Heterostigma separ var. **mediterraneum** var. nov. Gonades et anse intestinale.

Tout récemment j'ai étudié (6) une espèce nouvelle de ce genre, récoltée sur les côtes d'Algérie et donné, à cette occasion, une petite clef de détermination des trois espèces connues.

Le specimen de la Baie de Haïfa montre une tunique transparente, mince, pauvrement vêtue de sable.

La branchie, dépourvue de plis, comporte seulement 5 sinus longitudinaux de chaque côté. Les stigmates sont nettement spiralés dans la partie antérieure de la branchie, et transverses dans la partie postérieure (où s'arrêtent les sinus longitudinaux). Le tube digestif présente un estomac ellipsoïdal, verdâtre, avec quelques gibbosités hépatiques et un intestin gros et décrivant une large anse un peu anguleuse dans sa partie médiane.

La gonade est située du côté droit et comporte un ovaire en forme de boudin et un testicule constitué par une rosette d'acini (20–25) de taille diverses et piriformes. Les gonades sont mûres.

Par son absence de plis méridiens branchiaux le spécimen de Haïfa se range indiscutablement à côté de *Heterostigma separ* Arnbäck-Christie-Linde, espèce franchement arctique récoltée sur les côtes de la Nouvelle Zemble et qui possède également une seule gonade située à droite. La variété *mediterraneum* se distingue du type par les caractères suivants:

a. Taille très inférieure (1.5 mm au lieu de 5 mm).
b. 5 sinus longitudinaux de chaque côté au lieu de 6.
c. Anse intestinale un peu anguleuse dans sa partie moyenne alors qu'elle est régulièrement recourbée dans le type de l'espèce.

Je préciserai en passant que cette forme est absolument différente de l'espèce *Heterostigma gravellophila* que j'ai décrite des côtes d'Algérie et qui, par ses véritables plis méridiens branchiaux se rapproche au contraire de *H. singulare* (Van Name).

La présence en Méditerranée d'une variété d'une espèce arctique est évidemment une curiosité biogéographique, mais je rappellerai qu'il y en a au moins un autre exemple avec *Aplidium lacteum* Huitfeldt-Kaas, espèce connue de la côte occidentale de Norvège, du Spitzberg, de la Mer Blanche, de la côte mourmane et de la Nouvelle Zemble, et qui est représentée en Méditerranée par la variété *mortolaense* Brément décrite des parages de Monaco.

Styela plicata (Lesueur)

Echantillons: 54, 180, 209B, 353, 353B.

Stations: 2 (roche avec algues); 3 (sable et graviers); 7 (sable à *Caulerpa*)

Il est à noter que la plupart des spécimens sont nains (10–15 mm de haut). Les individus des fonds sableux à *Caulerpa* présentent une adaptation assez remarquable: la base de la tunique est entièrement imprégnée de sable et dilatée de façon à former une sorte de bulbe basal qui implante solidement l'individu dans le sédiment.

Polycarpa fibrosa (Stimpson)

Echantillon: 110.

Station: 11 (vase).

J'ai déjà indiqué précédemment[10] que *Polycarpa fibrosa* (Stimpson) est, de toutes les Ascidies méditerranéennes, celle qui descend le plus profondément et sans doute la seule qui vive normalement dans les formations que je considère comme appartenant à l'étage épibathyal (relevant du système aphotique). J'ai déjà signalé que cette espèce peut remonter dans les vases de l'étage circalittoral (relevant du système oligophotique) lorsqu'il y a continuité topographique entre ces vases de la partie inférieure du plateau continental et les vases épibathyales. C'est évidemment ce qui se produit sur les côtes d'Israël, car, bien que *Polycarpa fibrosa* soit l'Ascidie récoltée

le plus profondément par E. Gottlieb (48 brasses), on peut considérer que cette espèce est là au voisinage de sa limite supérieure de distribution bathymétrique en Méditerranée.

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THE PRESENT TAXONOMIC STATUS OF THE TERRESTRIAL MAMMALS OF PALESTINE

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The most reliable information on the mammals of the Pleistocene in Palestine is found in the monograph of Bate (1937). The fauna of Bible lands was first treated in a masterly way by Canon H.B. Tristram (1867) and more recently by the present writer (1950, 1955). The first modern trained zoological travellers visiting this country had very little time for zoological observations. Pierre Belon (1553) reports on a vole outbreak in the Gaza plain. Frederick Hasselquist (1757), who spent six weeks in the country in the spring of 1751, lists the following mammals: *Spalax ehrenbergi* near Ramle, *Herpestes ichneumon* in the hedges around Jaffa, *Hystrix indica* near Jericho, *Canis aureus* near Jaffa, *Vulpes vulpes* near Bethlehem, *Gazella gazella* and *Dama mesopotamica* on Mt. Tabor.

The most serious study of the mammals of Palestine was made in 1863-64 by H. B. Tristram (1866, 1884). He enumerates 113 species including the domestic and the extinct species and a few species from the Lebanon. His collection is today well preserved in the British Museum of Natural History. Five new races from Palestine have been described in later years from Tristram's material.

Little has been added to our knowledge of the mammals of Palestine by later travellers such as Festa, Barrois, Lortet, Phillips, Annandale and others, each of whom has earned great merit for other groups of animals.

Further progress was made by the first zoological pioneers settling in this country such as I. Aharoni and Father E. Schmitz. They and other local collectors submitted much material on local mammals to the Zoological Museum of Berlin, where A. Nehring and P. Matschie described many of our forms. The First World War brought in the wake of Allenby's army several active mammalogists such as Portal and Shortridge who were mainly under the guidance of S. S. Flower. This material was identified in the British Museum where O. Thomas, the superb master of mammalogy, and R. I. Pocock described many new forms from Palestine the types of which are still available in the British Museum. Relatively small in extent and depth was the result of the following decades. P. A. Buxton collected some mammals. A useful monograph on the Muridae of Syria and Palestine was published by B. Aharoni (1932). M. Dor studied the mammal skeletons from the pellets of the Barn Owl (1947). A survey on the mammals has been made by the author (1935, 1937, 1953).

Great impetus was provided by the foundation of the State of Israel in 1948. Even before this I. Aharoni had established his collection at the Hebrew University, which is now inaccessible on Mt. Scopus, and Y. Margolin with Dr. H. Mendelssohn, at the Biological Institute of Tel Aviv, started to gather a collection which is today the best of mammals available in this country. Smaller collections are found at Beit Gordon at Degania (Y. Palmoni), Beit Ussishkin at Dan (E. Hurwitz), the Teacher's Seminary at Oranim (A. Abulafia) and the Teacher's Seminary at Kfar Saba (M. Dor). Also the Hebrew University is building up a new collection.

The important *Checklist of Palaearctic and Indian Mammals* by Ellermann and Morrison-Scott (1951) now makes possible a more thorough classification of our mammals.

The present review is preliminary to the publication of a taxonomic monograph on the mammals of Palestine and comments and criticism are therefore invited for incorporation into the latter.

The number of colleagues who have helped me in the study of our mammals is too great to be enumerated. I would like to mention a few who are no longer with us — I. and B. Aharoni, Y. Margolin and S. S. Flower. Amongst those living I wish to single out Dr. H. Mendelssohn, Dr. M. Dor, Y. Palmoni, E. Hurwitz, Y. Wahrman and A. Zahavi and the staffs of the Tel Aviv Museum of Biology, the British Museum of Natural History in London and the Zoological Museum in Berlin, who kindly presented me with good working conditions and with the gift of a valuable series of photographs.

ZOOGEOGRAPHICAL CONSIDERATIONS

Tristram's (1884, p. 6) division of mammals from Palestine into Palaearctic, Ethiopic, Indian and 13 other species is no longer considered valid. According to our modern classification the deserts of North Africa do not belong to the Ethiopic Kingdom nor the high plateaus of Central Asia to India. There is still discussion as to whether this Saharo-Sindian region is the southernmost part of the Palaearctic Kingdom or if it forms together with the Irano-Turanian region a special Eremian Kingdom. There is little doubt, however, that historically the bulk of the Saharo-Sindian stocks is derived from the Ethiopian Kingdom, especially if invertebrates are included in the discussion. A. Nehring (1902, p. 300) still retained the continental zoogeographical orientation of Tristram, but shifted the southern limits of the Palaearctis northwards to a line from Mt. Carmel to the southern end of Lake Tiberias, and the northern borders of the Ethiopis to a line from Gaza to Ein Geddi, treating the intermediate area as a transitional zone.

We now accept the well known phytogeographical division of A. Eig (1932) as a basis for that of zoogeography. Hence, we distinguish three territories in Palestine: the Mediterranean maqui, the Saharo-Sindian desert and the Irano-Turanian steppe. There exist also a few penetrations of Sudanian and Euro-Siberian elements. The

climatic differences of these Palestine territories are no less sharp than those of the averages of the climates of these territories (see Bodenheimer 1935, p. 19, 46).

MAMMALS OF PALESTINE

SPECIES	RACES
Palaearctic	
Erinaceus concolor	*Rhinolophus ferrumequineum*
Crocidura portali	*Myotis nattereri*
Crocidura judaica	*Myotis myotis*
Rhinolophus ferrumequineum	*Myotis oxygnathus*
Rhinolophus minimus	*Pipistrellus kuhli*
Myotis nattereri	*Apodemus flavicollis*
Myotis myotis	*Apodemus iconicus*
Myotis oxygnathus	
Eptesicus turcomanus	
Plecotus christei	
Canis pallipes	
Martes syriaca	
Vulpes aegyptiaca	
Meles canescens	
Lutra seistanica	
Lepus syriacus	
Eliomys ?melanurus	
Apodemus flavicollis	
Apodemus iconicus	
Arvicola hintoni	
Mediterranean	
Microtus güntheri	*Crocidura portali (? I-T.)*
	Crocidura judaica
	? Rhinolophus minimus
	? Tadera taeniotis (? I-T.)
	Myotis cappacinii
	Canis syriacus
	Genetta terraesanctae
	Lepus syriacus
	Microtus güntheri
	Spalax ehrenbergi
Irano-Turanian	
Hemiechinus aegyptiacus	*Erinaceus concolor*
? Suncus etruscus	*Rhinolophus judaicus*
Rhinolophus blasii	*? Rhinolophus blasii*
? Tadarida taeniotis	*Eptesicus turcomanus*
Myotis cappacinii	*Otonycteris hemprichi*
Otonycteris hemprichi	*Miniopterus pulcher*
Vormela syriaca	*Vulpes flavescens*
Capra nubiana	*Martes syriaca*
Citellus citellus	*Vormela syriaca*
Allactaga euphratica	*? Mellivora capensis (S-S. ? Sud. ?)*

SPECIES	RACES
Dryomys pictus	*Meles ?canescens*
Spalax ehrenbergi	*Lutra seistanica*
Apodemus mystacinus	*?Hyaena syriaca*
Nesokia bacheri	*?Procavia syriaca*
Cricetus cinerascens	*?Capra nubiana*
Meriones syrius	*Citellus citellus*
Meriones crassus	*Allactaga euphratica*
Meriones tristrami	*Eliomys melanurus*
Arvicola hintoni	*Dryomys pictus*
	Apodemus mystacinus
	Nesokia bacheri
	Cricetulus cinerascens
	Meriones syrius
	?Meriones crassus
	Meriones tristrami

Saharo-Sindian

Paraechinus pectoralis	*Hemiechinus aegyptius (?)*
Rhinopoma microphyllum	*Paraechinus pectoralis (Sudanian ?)*
Taphozous nudiventris	*Rhinopoma microphyllum*
Rhinolophus acrotis	*Rhinopoma arabium*
Vulpes rüppelli	*Taphozous nudiventris*
Gazella dorcas	*Rhinolophus acrotis*
Gazella gazella	*Plecotus christei*
Lepus arabicus	*Vulpes aegyptiaca*
Lepus cheesmanni	*Vulpes rüppelli*
Jaculus jaculus	*Herpestes ichneumon*
Jaculus schlüteri	*?Felis tristrami*
Acomys russatus	*Felis furax*
Gerbillus arabium	*Panthera nimr*
Gerbillus dasyurus	*Gazella dorcas*
Gerbillus gerbillus	*Gazella saudiya*
Gerbillus allenbyi	*Gazella gazella*
Gerbillus pyramidum	*Lepus aegyptius*
Sekeetamys calurus	*Lepus arabicus*
Psammomys obesus	*Lepus cheesmanni*
	Jaculus jaculus
	Jaculus schlüteri
	Acomys dimidiatus
	Acomys russatus
	Gerbillus arabium
	Gerbillus dasyurus
	Gerbillus gerbillus
	Gerbillus allenbyi
	Gerbillus pyramidum
	Sekeetamys calurus
	Psammomys obesus

Palaeotropic

Rhinopoma arabium
Asellia tridens
Canis syriacus
Mellivora capensis
Hyaena hyaena
Felis tristrami
Panthera nimr

SPECIES	RACES
Ethiopian	
Rousettus aegyptiacus	*Rousettus aegyptiacus*
Nycteris thebaica	*?Asellia tridens*
?Pipistrellus kuhli	
Genetta terraesanctae	
Herpestes ichneumon	
Procavia syriaca	
Lepus aegyptius	
Acomys dimidiatus	
Oriental	
Miniopterus pulcher	*Canis pallipes*
Felis furax	*Felis schmitzi*
Hystrix indica	*Hystrix indica*
Introduced by Human Agency	
Myocastor coypus	*Myocastor coypus*
Rattus frugivorus	*Rattus frugivorus*
Rattus norvegicus	*Rattus norvegicus*
Mus praetextus	*Mus praetextus*

The zoogeographical subdivision as presented in this list is very different from that given before by us (1935, p. 91), and is based upon the *Checklist* of Ellermann

Element	For species	For races
Palaearctic	20	7
Mediterranean	1	10
Irano-Turanian	19	30
Saharo-Sindian	19	25
Palaeotropic	7	–
Ethiopian	8	2
Oriental	3	3
By human agency	4	4
Total	81	81

and Morrison-Scott (1951). The time seems ripe to reduce the number of the many races described by two earlier generations. Since such a reclassification requires more space than can be given here in connection with single forms, it will not be adopted in the present paper. In our forthcoming monograph, however, we will classify local mammals according to species and populations only. In the above list, the Mediterranean element has almost disappeared, the typical inhabitants of the Asiatic mountain areas extending from Israel to East Asia now being classified as Irano-Turanian. It is clear, however, that two very different groups are classed as Irano-Turanian: typical inhabitants of mountain regions and those of low steppes. We do not yet dare to distinguish between the two as two different elements as we are not sufficiently familiar — except for some experience in Anatolia and Iraqi

Kurdistan — with the fauna of these areas. It seems that the inhabitants of the lower steppes of southern Russia to eastern Arabia are a different fauna and perhaps element from that living in the high mountains of Anatolia to Central and East Asia. The mountain fauna still requires study, since the Syrian Coney and the Nubian Ibex, for instance, cannot be considered as from the same zoogeographical region. It is also not clear whether *Arvicola hintoni* should be classified according to the area in which it is found or its water requirements. In other cases the identification remains doubtful: the pale grey *Eliomys melanurus* is doubtless an Irano-Turanian racial element. Yet, if it is only a form of the dark grey *E. quercinus*, it belongs specifically to the Palaearctic fauna. These are only minor problems as compared to those raised by the historical elements or stocks. The European Hare has here been registered as Palaearctic, the Cape Hare as Ethiopian, in spite of the great overlapping of their distributions. It seems to us that the former belongs to the Palaearctic, the latter to the Ethiopian element.

The Palaeotropical elements are in a very confused state. As present day zoogeographical elements, they are typical tropical penetrants. Historically, however, they have belonged to three different stocks: the bulk of them is just the remainder of the Pikermi stock which lived in the Pliocene from Attika to northern Persia, and in the late Pliocene invaded Northeastern and East Africa, passing through Palestine. Now its descendents form the typical fauna of the East African savanna. To this stock belong the Striped and the Dotted Hyenas, the Ratel, the Leopard, and, locally extinct, the Warthog, the Kudu-Antelope, the Leggada Rat, and others. Ethiopian in origin are the Coney, the Ichneumon, *Rousettus aegyptiacus*, and perhaps the Genet, the Cape Hare and the Common Spiny Mouse; the latter may belong to the Pikermi stock. Oriental in origin appear to be the Cheetah, the Indian Wolf, the Indian Porcupine, the Caracal, *Miniopterus pulcher*, and the Persian Lion, if the latter does not belong to the Pikermi stock.

Another difficulty is the difference between species- and race-geography. The former should stress the general and historical character of the element. Very surprising is the complete disappearance of the Mediterranean element, as the only remaining species (*Microtus guentheri*) is doubtless of Irano-Turanian stock. This fact shows clearly that the Mediterranean region has little character of its own and is of very recent origin. It provides material for future analysis and revision. All Mediterranean races are fairly recent ones of various other elements: Tropical (Genet), Irano-Turanian (Mole Rat) or Palaearctic (Syrian Hare or Fox).

The increased importance of the Irano-Turanian element was already stressed. The big Saharo-Sindian component contains many clear hints of a historical connection with the present Ethiopian fauna. All in all, contrary to expectation and in spite of the fact that mammals and birds form the main basis of modern zoogeographical subdivisions, we are still unable to draw clear-cut conclusions. We have presented the zoogeographical picture as it appears to us today. We have little doubt

that positive criticism of competent mammalogists will be of great help in sorting out elements and stocks of the mammals of Palestine. We dare to ask for such help as many of the fundamental problems of zoogeography are intimately connected with the correct interpretation of a fauna which has always been regarded as a very complex one with regard to composition, history and site.

INSECTIVORA

Three hedgehogs inhabit Israel: 1.—The great, short-eared Transcaucasian Hedgehog, *Erinaceus europaeus concolor* Martin (1838), a race of the European Hedgehog which inhabits the area from Ciscaucasia to Israel (synonyms: *E. roumanicus sacer* Thomas 1916, *E. e. transcaucasicus* Satunin 1905). It is common in the hills and in the northern half of the country, but stragglers have been found as far south as Ruhama and Gaza. It is brown, occasionally blackish-brown, with a white belly and a uniformly brown face and small ears. 2.—The Long-eared Hedgehog, *Hemiechinus auritus egyptiacus* Fischer 1829 (synonyms: *Erinaceus syriacus* Wood, *E. brachydactylus* Tristram (1884, no. 95), is common along the coastal plain of southern Israel (El Arish, Gaza, Beersheba, Ramle, Tel Aviv, north to about Tulkarem). The big ears are conspicuous above the uniformly brown face; the belly is yellowish-brown. 3. — The Ethiopian Hedgehog, *Paraechinus aethiopicus pectoralis* Heuglin 1861, inhabits desert hills and wadis from the hills of Sinai throughout the southern Negev. The type came from Petra. The group is easily recognized by its markedly bicoloured face, white and black-brown. A good series is in the Tel Aviv Museum. It is possible, however, that more than one species of *Paraechinus* occurs in our South, as three species have recently been discovered in Egypt.

The European Water Shrew, *Neomys fodiens fodiens* Pennant 1771, was seen only by Tristram (1884, no. 93), near Wadi Kurn and the Litani River. Israel is far beyond the area of that species and, quite probably, a Water Shrew found by waters in the North would be the Mediterranean vicariant form *Neomys anomalus* Cabrera, of which a subspecies, *teres* Miller 1908, occurs in Anatolia. The attention of future collectors is directed to that form.

The tiny Pygmy Shrew, *Suncus etruscus etruscus* Savi 1822 (syn. *Sorex pygmaeus* Tristram 1884, no. 91), is fairly common everywhere in the Mediterranean area. Tristram's Shrew, *Suncus tristrami* Bodenheimer 1935 (p. 35) (syn. *Sorex crassicandus* Tristram 1884, no. 92), is not a synonym of the Giant Oriental, *Suncus murinus sacer* Ehrenberg 1833, which is almost rat-sized (135 + 80 mm). This form was introduced into houses in Suez by ships from the Orient, but has not become established in Egypt, as it could never be found again. Tristram's Shrew was a small, silvery shining species seen by him in the Negev. A damaged specimen in the Tel Aviv Museum has proved to be *Crocidura portali* (syn. *Suncus tristrami*).

By far the most abundant shrew in this country is the Greater White-toothed Shrew, *Crocidura russula judaica* Thomas 1919 (syn. *Sorex araneus* Tristram 1884, no. 89), described from Jerusalem. It is easily distinguished by its elongate

protracted nose. It is everywhere common except in the desert. The Smaller White-toothed Shrew, *Crocidura suaveolens portali* Thomas 1920, originally described from Ramle, is relatively rare. We have seen specimens only from the Negev (Tel Aviv Museum) and from Dan (Beit Ussishkin). *C. r. judaica* neither belongs nor is related to *Crocidura lasiura lasia* Thomas 1906, a species common in the Lebanon, but not yet found in Israel. Ellermann and Morrison-Scott (1951, p. 84) believed our common species ultimately to be connected with this big-headed, relatively short-tailed *C. lasiura*, which is certainly not the case. This does not preclude the occurrence of the latter species along our northern border.

CHIROPTERA

The Egyptian Fruit Bat, *Rousettus aegyptiacus* Hasselquist 1762, extends from Angola to Syria and Cyprus. In Israel it usually lives in caves all along the coastal plain and the Jordan Valley, more rarely in the hills (Dan, Mt. Carmel, Wadi Kurn, etc.).

The Larger Rat-tailed Bat, *Rhinopoma microphyllum* Brunnich 1782, is fairly common all over the country, rarer in the hills. The Lesser Rat-tailed Bat, *Rhinopoma hardwickei arabium* Thomas 1913, has been reported by Thomas from Jebel Qarantul (Coll. Tristram, now in British Museum). Further records are desirable.

The Naked-bellied Tomb Bat, *Taphozous nudiventris* Cretzschmar 1830, was found "in myriads in the caverns of the ravines opening to the Lake of Galilee" (Tristram 1884, no. 111). It has not been found in such numbers since, but scattered individuals have been found all over the country. The Egyptian Slit-faced Bat, *Nycteris thebaica thebaica* Geoffroy 1818, has been recorded by I. Aharoni (1930, p. 341) and again from Beit Shan as *N. albiventer* Wagner 1840 (1944, p. 26).

Six species of Horse-shoe Bats inhabit the country. The Greater Horse-shoe Bat, *Rhinolophus ferrumequineum ferrumequineum* Schreber 1771, is common in all Mediterranean parts of the country. *Rhinolophus clivosus acrotis* Heuglin 1861 was found in numbers in a storehouse at El Arish by Wassif (1953, p. 109). The Lesser Horse-shoe Bat, *Rhinolophus hipposideros minimus* Heuglin 1861, occurs in local collections from Herzlia, Beit Arava and Sheik Abreik. The East Mediterranean Horse-shoe Bat, *Rhinolophus euryale judaicus* Andersen and Matschie 1904, is common in caves in Jerusalem. It is also on record from near Lake Tiberias, Herzlia and elsewhere. *Rhinolophus blasii* Peters 1866 (syn. *Rh. clivosus* Blasius 1857) has been obtained from many parts of the country (Jerusalem, Herzlia, Sheik Abreik, etc.). The last of this group, the Trident Leaf-nosed Bat, *Asellia tridens tridens* Geoffroy 1813, lives all over the country (Dead Sea Basin, Jordan Valley, Jerusalem, Hezme, Jaffa). According to Harrison (1957, p. 4) the Palestine material is insufficient to determine the subspecific status. Yet it seems to be a form transient to the Arabian *Asellia tridens murraiana* Anderson 1881, which probably is only a cline form of *A. tridens tridens* and thus does not deserve a trinomial name.

The European Free-tailed Bat, *Taderida teniotis teniotis* Rafinesque 1814 (syn. *Nyctinoma cestoni* Savi 1825), was mentioned by Tristram (1884, no. 113) from caves

in the Jordan Valley. O. Thomas received another specimen from S. Merrill, then consul of the U.S.A. in Jerusalem. Recent collections record it from Yagur (Oranim Museum) and Herzlia (M. Dor 1947).

Still fairly unsettled is the status of the genus *Myotis*, of which probably more species have been quoted than occur here. Certainly there occurs in Israel Natterer's Bat, *Myotis nattereri nattereri* Kuhl 1817, which is quite common in Galilee and Herzlia, and has also been reported from Aqua Bella. The Large Mouse-eared Bat, *Myotis oxygnathus* Monticelli 1885, is the Mediterranean vicariant of the European *Myotis myotis myotis* Borkhausen 1797. Tristram's and I. Aharoni's *Vespertilio murinus* Schreber 1774 refers to the Mediterranean *Myotis*, which is also recorded from Palestine in Russian collections (Bobrynski 1944, p. 78). The European form, however, is also believed to occur (Sheik Abreik in the Tel Aviv Museum), but a new revision of this specimen is needed before the European species can be definitely admitted. The Mediterranean Long-fingered Bat, *Myotis cappacinii* Bonaparte 1837, was found by M. Dor in a local collection (no date, no locality). The identity is confirmed by Mr. R. W. Hayman of the British Museum, but further material is urgently required in order to clear the status of the species in this country.

The following three species, however, should not be entered into the list of our mammals before additional verification has been obtained. The Whiskered Bat, *Myotis mystacinus mystacinus* Kuhl 1819, was reported by Tristram (1884, no. 109) from the southern Lebanon. Goldblum (1951, p. 18) notes it from various parts of the country. The Tel Aviv Museum records it from Tiberias. Geoffroy's Bat, *Myotis emarginatus emarginatus* Geoffroy, is recorded by Tristram from Mt. Carmel (1884, no. 107). M. Dor has a further specimen from a local collection (no date, no locality). The Water Bat, *Myotis daubentoni daubentoni* Kuhl 1819, has been recorded by Tristram in a tomb at Tibnin, Galilee (1884, no. 106), but it is not present in his collection in the British Museum. Dor quotes it from Herzlia, but is now doubtful about this identification.

The Serotine Bat, *Eptesicus serotinus serotinus* Schreber 1799, has been recorded for Jerusalem, Tel Aviv and the Lebanon. The Common Noctule, *Nyctalus noctula noctula* Schreber 1774, has been collected by Festa (1894, p. 7) from a cave on Jebel Qarantul near Jericho, but the specimen is not present in the Museo di Torino (Prof. Pardi i. l.). As Palestine is outside the known area of distribution, it should be omitted for the time being. The same is true for Nathusius' Pipistrelle, *Pipistrellus nathusii* Keyserling and Blasius 1839, to which Tristram (1884, no. 105) probably refers. No other indication than this probable misidentification is available.

Kuhl's Pipistrelle, *Pipistrellus kuhli kuhli* Kuhl 1819, is a common species in the Mediterranean area of our country. Tristram (1866, no. 74) mentions *Scotophilus* sp., given later (1884, no. 105) as *Scotophilus temmincki* Horsfield 1824. It is impossible that this Oriental species should appear in Palestine (Ellermann and Morrison-Scott 1951, p. 178). If the genus was correctly identified the species could be the Ethiopian *Nycticeus schlieffeni schlieffeni* Peters 1859, which occurs in Egypt

and Arabia. But it should be omitted until it is eventually found again.

Hemprich's Long-eared Bat, *Otonycteris hemprichi hemprichi* Peters 1819, was collected by E. Schmitz in Wadi el Mukallih (near Nebi Musa). The specimen, identified by Matschie, is now in the St. Paulus Hospice at Jerusalem. Wassif (1953, p. 110) has it from El Arish.

The Great-eared Bat, *Plecotus auritus christei* Gray 1838, is common in the hilly country but occurs also elsewhere in Israel.

The Long-winged Bat, *Miniopterus schreibersi pulcher* Harrison 1956, is common all over the country as well as in Jordan. The special character "a very pale grey colour" was already noted by Tristram (1884, no. 110) for specimens from the Jordan Valley.

CARNIVORA

We include the Pariah Dog, *Canis familiaris dingo*, in the list of wild mammals. European zoologists have usually assumed that the Pariah Dog of the Near East is only a mongrel of many races of domestic dogs. This opinion was based upon the skulls present in European Museums which came from Istanbul, Smyrna, Beirut, Alexandria or Cairo, where many of the street dogs are mongrels of long standing. Yet the true Pariah Dog is still today the half-wild (not half-feral!) beast it was when man met it first in the Palaeolithic age (*Canis matris-optimae* Jeitt. of the archaeologists). The Menzels (1948) described its behaviour and five basic types from a heavy to a plump greyhound-like dog. We go farther and assume that we do not distinguish between the heavy Kurdish Sheep Dog of Central Anatolia and the highly inbred domestic Seluki and Tasi Greyhounds of the desert margin. There is no specific difference between them but rather a continuous transition supported by the changing environment and superimposed breeding. We believe that the Pariah is simply the ancestral dog from whose somewhat chaotic genetic composition man early bred any race he wanted from the big Molosser to the Dingo, the Canaani, the Seluki and the Tasi. Still today man can easily breed all these types from the simple unselected Pariah. All the Pariahs of the East from the southern Balkan peninsula to the Dingo of Australia, whose type was recently purely bred from Israel Pariahs, belong to this ancestral race. A morphological monograph on this impotrant Pariah group is overdue.

The Wolf seems to be today more an intruder from the East and from the North than a true inhabitant of Israel. In spite of a few dark-furred individuals we have seen, the race appears to be the smaller, pale Indian Wolf, *Canis lupus pallipes* Sykes 1831.

Our common Jackal is doubtless the Syrian Jackal, *Canis aureus syriacus* Hemprich et Ehrenberg 1833. A bigger jackal, the Egyptian Jackal, *Canis aureus lupaster* Hemprich et Ehrenberg 1833, is reported by Nehring (Coll. E. Schmitz 1908). S.S. Flower (1932) judges that from Gaza to the Lebanon two races of jackals occur, the bigger one probably being identical with the Egyptian *Canis lupaster*. We have not seen a specimen of this bigger race; future students should go into this question.

The common Fox of Israel has been described as *Vulpes vulpes palaestina* Thomas 1920. But actually this form is a member of a cline which extends from the Egyptian Fox, *Vulpes vulpes aegyptiacus* Sonnini 1816, to the Arabian Fox, *Vulpes vulpes arabicus* Thomas 1902. The different forms do not deserve a special name, the oldest known and valid name of the entire cline being *Vulpes vulpes aegyptiacus*. The fine furred, vivid, fulvous, larger Persian Fox with its splendid brush, *Vulpes vulpes flavescens* Gray 1843, was seen by Tristram (1866, no. 56) in Galilee. Its presence is probable, but requires confirmation. The presence of the Sand Fox, *Vulpes rueppelli rueppelli* Schinz 1825, was to be expected in our far South, as it occurs from Suez to the Persian Gulf. O. Thomas notes in his copy of Tristram's Mammals (1866) that *Canis famelicus* Cretzschmar 1826, a synonym, has been received by him from S. Merrill, the former U.S.A. consul at Jerusalem. It has not been reported since. Also the presence of the still unreported Fennec, *Fennecus zerda* Zimmermann 1780, in our far South is probable.

The Syrian Bear, *Ursus arctos syriacus* Hemprich et Ehrenberg 1828, common in Biblical times in Israel and still sighted in the last century in the North, is now extinct. E. Schmitz (1912, p. 174) describes the killing of a Syrian Bear on Mt. Hermon close to the border of Palestine. The type of Hemprich and Ehrenberg is of a uniform yellowish-white colour similar to that of the Polar Bear, only less white. All other specimens which we have seen from the Lebanon have a light-brown back, and are much lighter on the belly and sides (Figure 1). The Syrian Bear is still common in Anatolia, Northern Persia and the Caucasus.

Somewhat obscure is the present status of the Syrian Marten, *Martes foina syriaca* Nehring 1902, originally described from Wadi Seir (Lower Jordan). I. Aharoni (1930, p. 325) says that after the First World War it was commonly caught in traps near Jerusalem, Hebron, Nablus and many villages of the hills. This agrees with our observations that about 1929 fresh skins were sold by local fellahin in the streets of Jerusalem. Also Flower (i. l.) saw the fresh skin of a marten that had been killed in Palestine. Today, however, it is rare and has only just been reported from Eilon.

The European Polecat, *Mustela putorius* Linnaeus 1758, mentioned by Tristram (1866, no. 67) as *Mustela vulgaris* Erxleben, is no longer mentioned in his monograph of 1884 and may safely be eliminated from our list. In the steppes and hills of Israel lives the Syrian Marbled Polecat, *Vormela peregusna syriaca* Pocock 1936, whose type originated from Tiberias (see Figure 3).

The Ratel, *Mellivora capensis wilsoni* Cheesman 1920, is noted in the handwriting of O. Thomas in Tristram's paper on mammals (1866). I. Aharoni (1930, p. 336) mentions it as rare in the hills. S. S. Flower (i. l.) informed us that he had one from Gaza and that it generally appears in southern Palestine. This author records a skin bought in Jerusalem from fellahin who had shot it between Bethlehem and the Dead Sea (1935, p. 109). In recent years it has been found at Ein Hussub (Negev) and at Umm Falik (Upper Galilee).

The race of our common Badger, probably *Meles meles canescens* Blanford 1875, inhabits all our Mediterranean areas and the Upper Jordan Valley.

The Persian Otter, *Lutra lutra seistanica* Birula 1912, is rapidly increasing, as it thrives well on the many fish ponds of the country. It is fairly common also along all natural water courses. The Palestine Genet, *Genetta genetta terraesanctae* Neuman 1902, is found in Tristram's collections from Mt. Carmel (1866, no. 64) and is later described by Neuman. I. Aharoni (1912, p. 400; 1930, p. 334) collected further specimens from Sejera and from Wadi Fauar (Dead Sea).

Still common along hedges of villages and among rocky country is the Common Ichneumon, *Herpestes ichneumon ichneumon* Linnaeus 1758, known as a potential predator of fowl houses.

On the status of our local hyenas, E. Schmitz (1913, p. 95) wrote that at least five different races of hyenas live in this country, while I. Aharoni (1930, p. 332) records only two races. Pocock (1934, p. 812), however, refers all Near East forms to the Syrian Striped Hyena, *Hyaena hyaena syriaca* Matschie 1900. The type from Antioch (probably a winter fur) has almost no lateral striation (Matschie 1900, p. 54), while all of the many specimens we have seen from Israel have a very distinct lateral striation. This was, of course, well known to Pocock and has not influenced his decision, which is based mainly on skull and other morphological characters. We accept the decision of this expert (Figure 2).

The Palestine Wildcat, *Felis silvestris tristrami* Pocock 1944, is based upon a specimen collected by Tristram in Moab. We agree with Haltenorth (1953, p. 45) that the African, Asiatic, and European Wildcats should all be united as one species. Even if the European Wildcat is undoubtedly derived from a tropical—probably an Ethiopian—ancestor, the oldest available name is that for the European form. It is still fairly common in the hills and in rocky maqui all over the country (syn. *Felis syriaca* Tristram).

Fairly common is the Palestine Jungle Cat, *Felis chaus furax* De Winton 1898, described from Tristram's collections at Jericho. It is really regrettable that the very descriptive name *chrysomelanotis* Nehring 1902, "the golden one with the black ears," came a few years too late to be accepted (Fig. 3). It is present in all large local collections. The Southern Lynx, *Felis lynx pardina* Temminck 1824, is a northern Mediterranean form. Its presence in Palestine has never been confirmed, although Tristram (1866, no. 64) believes he saw it. I. Aharoni (1930, p. 332) is doubtful about its occurrence in Transjordan. The Syrian Caracal, *Felis caracal schmitzi* Matschie 1902, is the first race described from Asia and thus is also the name for the Indian form of the Caracal, which is identical with that from Palestine. Described originally from wadis opening to the Dead Sea, it was later found on Mt. Carmel (I. Aharoni 1930), El Arish (Flower 1932), Mt. Herodes near Bethlehem (Schmitz 1912-13), and Haifa (Haifa Museum). A pair was shot in early 1958 near Eilat.

The Israel race of the leopard is the Arabian Leopard, *Panthera pardus nimr* Hemprich et Ehrenberg 1833. The original description is based on specimens from Arabia and from Abyssinia. Ellermann and Morrison-Scott (1951, p. 316) have decided in agreement with others to fix the type for Arabia. The comparison of three skins from Galilee with those of the very light Sinai Leopard, *Panthera pardus jarvisi* Pocock 1932, and the brown-backed Anatolian Leopard, *Panthera pardus tulliana* Valenciennes 1856, in the British Museum showed convincingly that our specimens belong to the Arabian race. It is doubtful, however, that the species is still a full-fledged inhabitant of this country. It seems that single individuals are vagrant from the Lebanon to Israel only in seasons of scarcity of food. In northern Jordan it may still exist.

The Persian Lion, *Panthera leo persica* Meyer 1826, so common in the Bible, has been extinct in Israel since the 13th century, when the last specimen was hunted at Lejun (near Megiddo).

The Asiatic Cheetah, *Acinonyx jubatus venaticus* Griffith 1821, was still reported by Tristram and Schmitz from Moab, but never since. It is probably extinct now in Jordan, while in Israel it has not been seen for over a hundred years.

HYRACOIDEA

The Syrian Coney, *Procavia capensis syriaca* Schreber 1784, is definitely recognized as the Syrian animal (Ellermann and Morrison-Scott 1951, p. 335), and separated from the Abyssinian form as the northernmost form of the species (Mt. Lebanon to Sinai). Synonyms of it are *Procavia sinaiticus* Gray 1868 and *Procavia sinaitica schmitzi* Brauer 1917. It inhabits three areas in Israel (hills of the Dead Sea Basin, Mt. Carmel, Upper Galilee). Dr. H. Mendelssohn, Tel Aviv, has been successfully breeding the coney for several years.

PERISSODACTYLA

The Syrian Onager, *Equus hemionus hemippus* Geoffroy 1855, has been extinct in the Syrian Desert for at least 100 years. Recently Missonne (1957) expressed belief in rumours of local inhabitants that it still exists in the extreme north of Syria, but we believe that these are merely rumours which have survived for generations.

ARTIODACTYLA

Another animal of uncertain racial status was the Palestine Boar, *Sus scropha libycus* Grey 1868. The Archduke Rudolph of Hapsburg (1884, p. 44) remarked that the boars of the Jordan Valley looked as powerful as those of the Hungarian forests (*S.s. attila* Thomas 1912). It is much smaller than this race. At present it still occurs in

Upper Galilee, especially in the thickets of the Hula, also in those of the Araba, while it has disappeared within this generation in the coastal plain.

The three deers have disappeared in their usual sequence. First to disappear was the Red Deer, *Cervus elaphus ?maral* Gray 1850. Much later, the Levant Fallow Deer, *Dama mesopotamica* Brooke 1875, which was so common at the time of the late Palaeolithic caves (Bate 1937), disappeared. It was still seen by Hasselquist in 1750 on Mt. Tabor. In 1923 we saw the antler of a very young animal from Jerash in the shop of the American Colony. Nothing has been seen or heard since of the Fallow Deer. The Roe Deer, *Capreolus capreolus capreolus* Linnaeus 1758, was still common at the beginning of this century on Mt. Carmel and in Upper Galilee, but has been extinct for at least one generation.

The Aurochs, *Bos taurus primigenius* Boianus 1827, was still common about 7000 B. C. in the plain of the lower Jordan, as Zeuner (i. l.) has demonstrated from his examinations of the lowest stratum of the old town of Jericho. This makes it easy to understand why the "re'em" was in the Bible the symbol of power. It has not been reported since.

The Bubal Hartebeest, *Alcelaphus buselaphus buselaphus* Pallas 1766, or a closely related form, lived in Palestine in the late Pleistocene (Bate 1937, p. 215). The quotation of Tristram (1866, p. 86) is simply a misidentification for *Oryx leucoryx*, the real "Bakr el Wash" of the Arabs. All later citations go back to this error. There is no indication that any Hartebeest has occurred on Asiatic soil in historic times. Also all references to the Addax, *Addax nasomaculatus nasomaculatus* Blanville 1816, go back to a doubtful identification of Tristram (1866), who thinks that he saw it once in the Araba (recognised by its horns), but in 1884 (no. 14) he says that his "claim for its inclusion here is rather historical than actual." We doubt the validity of this identification, as even in Egypt the very last reference was about 1900. Again, the Arabian Oryx, *Oryx leucoryx* Pallas 1777, once common in the Syrian Desert, has long since disappeared even from the eastern deserts of Jordan.

Two species of gazelles still inhabit Israel, after having been almost exterminated by the sportsmen of two World Wars. The Dorcas or Red Gazelle, *Gazella dorcas dorcas* Linnaeus 1758, is the gazelle of the deserts and steppes. It is nowadays seen mainly in small flocks, no longer in the big herds which earlier travellers sighted at certain seasons. The Saudian Gazelle, *Gazella dorcas saudiya* Carruthers and Schwartz 1935, is the Saudian form of the Dorcas, much smaller than the type form and with different horns. It has once been recorded from Ein Radian (1952, Tel Aviv Museum). It still remains doubtful if our southern *G. dorcas* belongs to this form. The Arabian, Mountain or Grey Gazelle, *Gazella gazella gazella* Pallas 1766 (syn. *Gazella merrilli* Thomas 1904), is the common form of our hills and inland valleys. It has increased after the Second World War and is now often seen in the mountains near Jerusalem, on the Carmel, in Galilee, and scattered individuals have been found south of the Dead Sea.

The Nubian Ibex or Beden, *Capra ibex nubiana* Cuvier 1825 (syn. *Capra sinaitica* Ehrenberg 1833), was on the verge of extinction after World War II. Thanks to the splendid cooperation of the Israel Army, it is now on the increase in its native habitat, a narrow mountain stretch from Ein Geddi to far south into the Araba. We lack information on its present status in Jordan.

I. Aharoni (1926, p. 253; 1930, p. 328) is the only author who mentions "el Kebsh," a wild sheep. He identifies it as the Egyptian Arui, *Ammotragus lervia ornatus* Geoffroy 1827, which he reports as still living in the Araba early in this century. Yet at that time it was already on the verge of extinction in southern Egypt (Flower 1932, p. 435) and has never been reported from Sinai. We doubt if the North African *Ammotragus* was ever in historical times in Palestine. If a wild sheep really lived in our southern mountains, it was much more probably the Asiatic Mouflon, *Ovis orientalis anatolica* Valenciennes 1856, which still persists in the Cilician mountains.

LAGOMORPHA

Our largest hare is the Syrian Hare, *Lepus europaeus syriacus* Ehrenberg 1833, common in all our Mediterranean areas. We have so far remarked that in this country it is easily distinguished by its pure white belly. Further observations in this respect are required. In our Mediterranean areas only one other form occurs, which Tristram shot at Banyas (British Museum skull 64.8.17.5.) and which was described as *Eulagus* gen. nov.—*Lepus europaeus judeae* Gray 1867. Tristram (1884, no. 29) protested against this description: "It seems to me that it is so near to the Persian *Lepus craspedotis* Blanford 1875, that I hardly like to separate them." I think that Tristram was right, but more material from our northeastern area is desired before a final conclusion can be drawn. Today the Persian species should be named *Lepus sinaiticus craspedotis* Blanford 1875. It is not uncommon to find penetration of Irano-Turanian forms into Upper Galilee.

Ellermann and Morrison-Scott (1951, p. 426) separate *Lepus arabicus* Ehreberg from all other hares in this country by their large bullae tympanicae (over 16% of the occipito-nasal length). If this principle is valid, then the Sinai Hare, *Lepus sinaiticus* Ehrenberg 1833, also belongs to that species. The Sinai Hare, *Lepus sinaiticus sinaiticus* Ehrenberg 1830, with black waves in the light brown fur and with dark belly, is the common form in our southern deserts, at least in the Araba and east of it. Here probably belongs the skull mentioned by Ellermann and Morrison-Scott (1951, p. 434) from Palestine in the British Museum, as well as a skull collected by I. Aharoni in the Museum of the Hebrew University, both with great bullae. The Egyptian Hare, *Lepus capensis aegyptiacus* Desmarest 1822, is mentioned by Tristram, I. Aharoni and Hart from Beersheba, the Araba and the Jordan Valley. It is a small hare with long ears and with a shorter hindfoot than that of the Sinai Hare. We have not yet any definite later record, but we do not doubt its presence, as the species

is found in an extended area reaching from the Cape to Central Asia if the given circumscription in the *Checklist* is correct.

Tristram (1884, no. 28) mentions the Isabelline Hare, *Lepus isabellinus* Cretzschmar 1826, as rare in the southeastern deserts. Ellermann and Morrison-Scott (1951, p. 433) justly doubt the presence of this Nubian hare in Palestine. The only neighbouring hare which is small and light fawn-yellow in colour is Cheesman's Hare, *Lepus cheesmanni* Thomas 1921, probably a species of its own. This animal, abundant in Arabia and probably in the Syrian Desert, may easily straggle occasionally into the far East of Palestine. We found a typical individual in the collections of the British Museum from Hamma in Syria.

RODENTIA

The Persian Squirrel, *Sciurus anomalus* Güldenstaedt 1782 (syn. *Sciurus syriacus* Hemprich et Ehrenberg 1828, *S. historicus* Gray 1867, *S. pallescens* Gray 1867), was still seen by Schumacher in northern Jordan at the beginning of this century. Now it seems extinct everywhere in the area, but is still common in the Taurus Mts. It is one of the few animals that could be easily introduced into Israel for acclimatisation.

The European Suslik, *Citellus citellus citellus* Linnaeus 1766 (syn. *Citellus xanthoprymnus* Bennet 1833), was found abundantly by Tristram (1884, no. 61) in the sandy and stony uplands of Moab and Gilead. We have no recent record.

Our porcupine belongs, according to its skull structure (short and narrow nasals), to the Indian Crested Porcupine, *Hystrix indica* Kerr 1792 (syn. *H. hirsutirostris aharonii* Müller 1911, *H. hirsutirostris schmitzi* Müller 1911), which is common in all climatically suitable areas in the country (see Figure 4).

A new introduction is the Nutria or Coypu, *Myocastor coypus* Molina 1782, from Chile. It was introduced for fur farming into Kfar Masaryk and Kfar Ruppin as one of the few mammals whose fur does not deteriorate in our hot climate. In both places escapees have become feral in the reed thickets without so far causing any damage.

Of jerboas, the Euphrates Five-toed Jerboa, *Allactaga euphratica* Thomas 1881, was already depicted as *Dipus hirtipes* Licht. from the deserts of Jordan by Tristram (1884, no. 60, pl. VI; see also Nehring 1901, p. 169). P. A. Buxton found it later near Amman (British Museum 22.6.4.2). Apart from being distinguished by its toes, it is easily separated from our other jerboas by its tiny bullae tympanicae. The species of the south of our country is the Common Jerboa, *Jaculus jaculus jaculus* Linnaeus 1758, first discovered by Hasselquist in Egypt. Schlüter's Jerboa, *Jaculus schlüteri* Nehring 1901, was described and later found again in the dunes south of Jaffa.

The skulls of both of these two latter forms have large bullae tympanicae. Those of *J. jaculus* diverge distinctly after having almost touched at one point of their inner margin. Those of *J. schlüteri* are distinctly greater and touch at their inner margin. We believe them to be different species. The Three-toed Jerboa, *Dipus sagitta* Pallas 1773 of Tristram (1884, no. 59), can certainly be omitted from our list, as its southern border runs too far away from this area.

The Levant Garden Dormouse, *Eliomys melanurus* Wagner 1840, lives in the Negev as well as the highlands of Moab and Edom. Recently it has been found at Dan in Upper Galilee. Possibly it is only a pale grey steppe form of the Common European Garden Dormouse, *Eliomys quercinus* Linnaeus 1766, of a dark grey, inhabiting a different niche. The position of the Fat Dormouse, *Glis glis ?orientalis* Nehring 1903, is not clear. Tristram (1884, no. 64) records it as very common in the oases of the Jordan Valley, especially at Jericho, where "it has its nest in every *Zizyphus* shrub," but his collection in the British Museum does not include it. I. Aharoni (1930, p. 337) notes that it is less wide spread than *Eliomys melanurus*. It has not been found in this country nowadays by any competent observer, in spite of the fact that it has been especially sought. It is thus omitted from our list.

The yellowish-brown Forest Dormouse, *Dryomys nitedula phrygius* Thomas 1907, is probably the species quoted as *Myoxus dryas* Schreber by Tristram (1884, no. 66) and as common in low thick bushes in the desert regions. Nehring (1902, p. 45) accepted this identification. One specimen from Hurfeish (Jebel Jermak) in Upper Galilee (1951) is in the Tel Aviv Museum.

The Syrian Mole Rat, *Spalax ehrenbergi ehrenbergi* Nehring 1898 (syn. *S. kirgisorum* Nehring 1898, *S. intermedius* Nehring 1898, *S. berytensis* Miller 1903), is very common in all terra rossa and similar lands in Palestine. The name *S. kirgisorum* has page-precedence over *S. ehrenbergi*, but in the figures given on an earlier page *S. ehrenbergi* precedes *S. kirgisorum*. Miss Bate (1945, p. 146) concludes that as in works published before 1931 figures are regarded as valid descriptions, the name *S. ehrenbergi* remains according to the rules of nomenclature.

The genus *Apodemus* will be fully treated in our monograph. Here it may suffice to state that the Big Levantine Field Mouse, *A. mystacinus* Danford and Alston 1877 (syn. *A. smyrnensis* Thomas 1903, *A. flavicollis pohlei* B. Aharoni 1932), with its bluish-grey fur and an average occipito-nasal skull length of 30 mm, is the common form in the north as well as around Jerusalem, where Costa found it recently. *A. flavicollis* Melchior 1834, the Yellow-necked Field Mouse, is reddish-brown grey above, yellowish-white below, about 27 mm in skull length. It was first discovered by M. Dor in the pellets of *Tyto alba* on Mt. Carmel. The orange-yellow gular band is not restricted to this species. The smallest, the Common Field Mouse *A. sylvaticus Linne* 1758), is rare in the north. It has a grey back and a dirty white belly and a skull length of about 25 mm. These three species all live in Israel.

The Brown Rat, *Rattus norvegicus norvegicus* Berkenhout 1769, is not yet mentioned by Tristram (1884) or by B. Aharoni (1932, p. 177). It established itself in the thirties in the port towns of Haifa, Jaffa and Tel Aviv, especially in the lower part of buildings, whose upper stories are still inhabited by the Black Rat. A census on the rats throughout the country is urgently required. The Common or Black Rat, *Rattus rattus frugivorus* Rafinesque 1814, abounds especially in rural areas. Most common is its subtropical commensal form *Rattus rattus alexandrinus* Geoffroy 1803. Scattered everywhere in buildings is the northern commensal form *Rattus rattus rattus* Linnaeus 1758, a blackish form obviously not established here, but always appearing as recurrent mutations in the other populations of the species. The yellow-bellied *Rattus rattus flaviventris* Brants 1827 is a synonym of *R. r. frugivorus*, prevailing in more arid areas. We prefer to assign the name of the wild form to this and to other species, in spite of the fact that the commensal form, the one in most intimate contact with man, was the earliest form described, although only a later derivation from the wild form.

This problem is still more complicated in the Common House Mouse, of which we assume that the wild form is *Mus musculus wagneri* Eversmann 1848, which does not inhabit Palestine. Here only feral forms are known, which should be called *Mus musculus praetextus* Brants 1827 (syn. *M. musculus gentilis* Brants 1827, *M. musculus bactrianus* Blyth 1846). As a rule lighter forms occur in more arid conditions (El Arish), and darker, light-brownish ones in normal commensal conditions. *Mus musculus vigneaudi* Demurs et Prevost 1850 (syn. *M. musculus orientalis* Cretzschmar 1826) has been mentioned by error only (B. Aharoni 1932, p. 185). We see no point in treating *M. m. praetextus* and *M. m. bactrianus* as separate forms, as the entire range of variation occurs within almost every population, except, as stated above, that the desert populations tend to be lighter.

The Nile Rat, *Arvicanthus niloticus niloticus* Desmarest 1822, has been quoted by Tristram as *Mus variegatus* Lichtenstein 1823 (1844, no. 41). He did not see it himself, nor did anyone after him, so that we will omit it from the list of our fauna.

The Common Spiny Mouse, *Acomys dimidiatus dimidiatus* Cretzschmar 1826 (syn. *Mus megalotis* Lichtenstein 1829), with a light golden-brown back and white belly sharply delineated at the sides, is the typical wild form of a species wide-spread in the Negev. In the coastal plain, in Galilee, in southern Judaea, another form with grey back, light yellow-brown sides and the typical white belly is common, while around Jerusalem lives a form with mouse-grey back and sides and white belly. We refrain from giving names to these well-defined forms of a definite geographical pattern.

If *Acomys cahirinus* Desmarest 1819 with its black-grey back and not definitely dirty belly is a good species or only a commensal form of the wild *dimidiatus* is doubtful. At any rate the typical *A. cahirinus* has not been observed in Israel so far.

The Golden Spiny Mouse, *Acomys russatus* Wagner 1840, with spines reaching almost to the neck, lives in the Dead Sea Basin, the Araba and the southern Negev. Its mention by I. Aharoni (1930, p. 338) in the cellar of a Jerusalem house is obviously a *lapsus calami* for *A. dimidiatus*, which in winter often enters houses in Jerusalem.

The Short-tailed Bandicoot, *Nesokia indica bacheri* Nehring 1897, with its white gular spot, was originally described from the Ghor es Safiye, and later found again by Bacher in Moab (Nehring 1897, 1898). Tristram found it still earlier. One specimen from the Dead Sea Basin is in his collection (British Museum 64.8.17.28). Also the collection of E. Schmitz contains one specimen (without locality).

The big Migratory Hamster, *Cricetulus migratorius cinerascens* Wagner 1848, is apparently our only hamster. It is common all over the Mediterranean area of this country. The Golden Hamster, *Mesocricetus auratus brandti* Nehring 1898, with its big black breast spot, is mentioned by B. Aharoni (1932, p. 174) from Metulla. We have never seen this conspicuous form, which occurs in the Lebanon. The nominate form *Mesocricetus auratus auratus* Waterhouse 1839 was here introduced as a pregnant female by I. Aharoni from Aleppo. This deserves mention, in spite of its living only under domesticated conditions in this country, as apparently all Golden Hamsters now bred all over the world as pets and laboratory animals appear to be descendants from the one pregnant female which Aharoni brought to Jerusalem (Ben Menahem 1934, p. 403).

The Gerbils and Jirds (Gerbillinae) of Israel have just been thoroughly revised by Petter (taxonomy and taxonomic key, 1957) and by Zahavi and Wahrman (chromosome numbers, 1958). We gladly accept this multifaceted revision, adding only a few remarks. All valid species mentioned in the following lines are from the Negev, mainly sand dwellers, if not otherwise assigned:

The Balujistan Gerbil, *Gerbillus nanus nanus* Blanford 1875 (syn. *Dipodillus quadrimaculatus* Nehring 1901, nec Lataste 1882): Thomas (1918) named *Dipodillus arabium* Thomas 1918 a form from Tibuk (N. W. Arabia) with large bullae tympanicae and differences in the pilosity of the soles. While Petter (1957) is inclined to group animals from Wadi Araba as *Gerbillus arabium*, Zahavi and Wahrman state that the differences are those of age, assuming the form of *arabium* to be the aged one, with all transitions being present in every population.

Wagner's Gerbil, *Gerbillus dasyurus dasyurus* Wagner 1842 (syn. *Dipodillus dasyuroides* Nehring 1901): *Gerbillus nanus* and *G. dasyurus* can be differentiated only by the skull.

The Lesser Egyptian Gerbil, *Gerbillus gerbillus gerbillus* Olivier 1801. Allenby's Gerbil, *Gerbillus allenbyi* Thomas 1918 (syn. *Meriones longicaudus* Nehring 1901), has been separated by the recent revisers from the following species.

The Greater Egyptian Gerbil, *Gerbillus pyramidum pyramidum* Geoffroy 1825 (syn. *Gerbillus tarabuli* Thomas 1902, *G. floweri* Thomas 1919, *G. pyargus* Tristram

1866, no. 36): The latter form raises a number of taxonomic problems. *G. allenbyi* is cytologically and taxonomically different. But *G. pyramidum* is taxonomically *one* species which shows at least three different cytological populations: that of Algeria, and two in Palestine which differ by the male mechanism XY vs. XY_1Y_2, the one living in the coastal plain, the other in the Negev. They offer a puzzling problem in the dunes of the coastal plain. *G. allenbyi* is the dominant population from Caesarea to Gaza. North of the Yarkon it is the only form living on all the many types of dunes. South of the Yarkon river to Gaza it apparently lives only on lower inland dunes with dense vegetation (Zahavi and Wahrman 1958), while the coastal plain population of *G. pyramidum* occupies the higher dunes towards the sea. This peaceful separation of both forms in different biotopes permits close co-existence without territorial struggles. If even minor ecological predilections combine with a disinclination to inhabit the same territory, a peaceful co-existence is granted, the closer study of which is extremely desirable. Perhaps a closer study of the cytologically different populations of *G. pyramidum* of the coastal plain and of the Negev will also reveal morphological differences. The Negev and coastal plain populations of *Jaculus jaculus jaculus* — with *J. schlüteri* playing a similar role as *G. allenbyi* — may offer a similar geographical problem.

The Bushy-tailed Jird, *Sekeetamys calurus* Thomas 1892, belongs here. The Beersheba Jird, *Meriones sacramenti* Thomas 1922 (syn. *Meriones erythrouros legeri* B. Aharoni 1932, *Meriones erythrourus* Hart 1891, *Gerbillus melanurus* Tristram 1866, no. 35) of our southern deserts is, according to Zahavi and Wahrman (1958), different from *Meriones syrius* Thomas 1919. In the south lives also Sundevall's Jird, *Meriones crassus crassus* Sundevall 1842.

Tristram's Jird, *Meriones tristrami* Thomas 1892, is based upon two specimens collected by Tristram. The type, originally determined as *Psammomys tamariscinus* Pallas (Brit. Mus. 64.8.17.35), has the label "south end of the Dead Sea." This locality should probably be corrected to Beersheba. Another individual of the same collection was identified as *Gerbillus taeniurus* Tristram (1866, no. 34). The species is certainly different from *Meriones shawi* Duvernoy 1842 as well as from *M. tamariscinus* Pallas 1773, but perhaps it may belong to *M. blackleri* Thomas 1903. It is common in the Mediterranean hills and in the Irano-Turanian plains of this country, most other records probably belonging only to years of outbreaks. An albino variety has been bred by J. Naftali and J. Wolf (1955) which seems to be suitable for use as a laboratory animal.

The Sand Rat, *Psammomys obesus obesus* Cretzschmar 1826 (syn. *Psammomys terraesanctae* Thomas 1902) is fairly common in all sandy areas of the South. In arid soils it has been found to be of lighter shade, and in humid soils of darker shades. The tail length is extremely variable.

The Syrian Water Vole, *Arvicola terrestris hintoni* B. Aharoni 1932, was already noted by Tristram (1866, no. 41) "in the North," probably beyond the borders of

Palestine. I. Aharoni (1930, p. 340) records it as common near Banyas, but B. Aharoni (1932, p. 209) does not mention it from Palestine. M. Dor found 21 skulls in pellets of the Barn Owl *Tyto alba* at Yessod Hamaale (1947, p. 50). E. Hurwitz found a few more skulls near Melaha in pellets. We know some of its regular paths into the reeds of Lake Hula but have so far been unable to bait, trap or shoot it.

The Levant Vole, *Microtus güntheri güntheri* Danford and Alston 1880, is the common field mouse in all our Mediterranean plains (Bodenheimer 1949) (syn. *Microtus philestinus* Thomas 1917). Two related species inhabit the higher altitudes of the Lebanon and Anti-Lebanon (Bate 1945) which may penetrate along our northern borders: the Snow Vole, *Microtus syriacus syriacus* Brants 1827 (syn. *Hypudaeus syriacus* Brants, conspecific with *M. nivalis* Martins 1842, but antedating *nivalis* by 15 years; *M. hermonis* Miller 1908), and the small Social Vole, *Microtus socialis paradoxus* Ognev und Heptner 1928, a western penetrant of an Irano-Turanian species of wide distribution.

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Figure 1

Skins of Syrian Bears.

Left: Type of *Ursus syriacus* Hemprich et Ehrenberg from the Lebanon. The pale yellow shade of the fur is well recognisable. Right: The type of *Ursus schnitzi* Matschie from Mt. del Shems (Hermon). The light brown colour of the fur contrasts with the light colour of the belly. Photographs by courtesy of Prof. K. Zimmermann of the Zoological Museum, Berlin.

Figure 2.

Skins of Striated Hyenas

Left: Type of *Hyaena syriaca* Matschie from Antioch. Right: A typical Israel specimen from Elbiran (coll. I. Aharoni). The lateral striation is absent in the type-specimen (winter fur), but conspicuous in all Israel specimens which we know. The striation is distinct in both on the hindlegs. Photographs by courtesy of Prof. K. Zimmermann of the Zoological Museum, Berlin.

Figure 3.

Left: Head of the type of *Felis chrysomelanotis* Nehring from Jordan. Right: Head and breast of the type of *Mustela foina syriaca* Nehring from Wadi Seir.
Photographs by courtesy of Prof. K. Zimmermann of the Zoological Museum, Berlin.

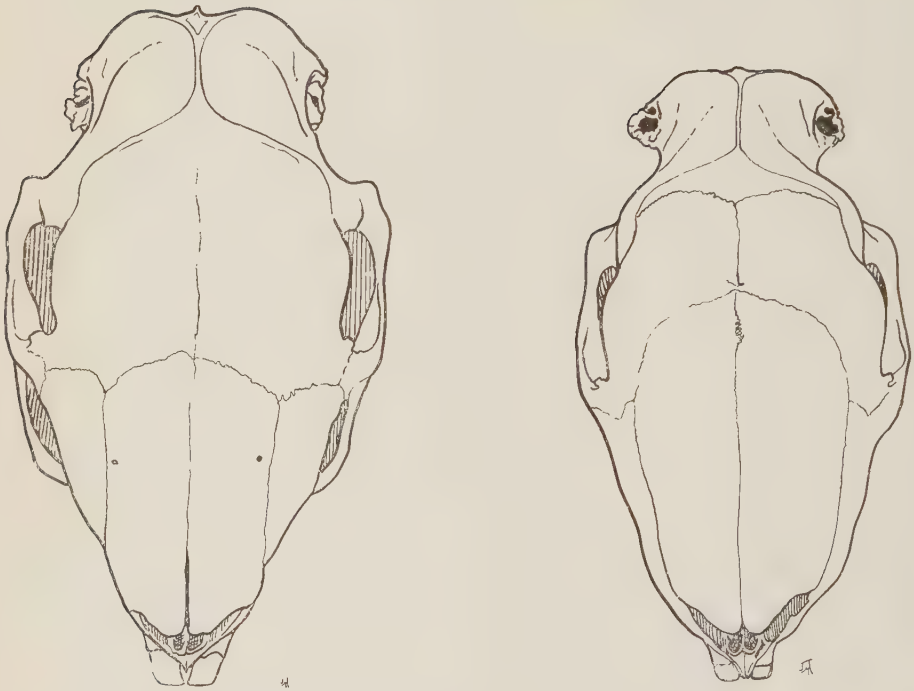

Figure 4.

Skulls of Porcupines.

Left: *Hystrix indica* Kerr (with shorter and narrower nasals, but broad frontals). Right: The African *Hystrix cristata* Linnaeus (with longer and slightly broader nasals and short frontals).
Drawn by Miss J. Ingles of the British Museum (N. H.), London.

THE DEVELOPMENT OF CORRIEDALE AND RAMBOUILLET LAMBS ON NATURAL PASTURE IN ISRAEL

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ABSTRACT

Corriedale and Rambouillet lambs, born in January and February, were kept on natural pasture under similar conditions. The lambs were weighed after birth and at monthly intervals. The male lambs were slaughtered at the age of four months, and the carcase, pelt, head, legs and inner organs weighed separately.

The trial demonstrated the superiority of the Rambouillet to the Corriedale lambs on natural pasture in Israel.

The male Rambouillet lambs, at the age of four months, gained approximately 10 kilograms live weight or nearly 50 per cent more than the male Corriedale lambs.

The negligible gains in live weights recorded in both breeds during the fourth month suggest that Corriedale and Rambouillet lambs, kept under farming conditions similar to those of the trial, should be slaughtered at the age three months.

In carcase weight the Rambouillet lambs exceeded the Corriedale lambs at the age of four months by an average of 5.675 kilograms, or more than 57 per cent.

Lambs of both breeds had similar pelt weights; but in relation to live weights the pelts of the Rambouillet lambs weighed one-third less than the Corriedale pelts.

In the sale of four-month-old male Corriedale and Rambouillet lambs for slaughter a deduction of 8 per cent from live weight may replace fasting for 18 hours.

INTRODUCTION

The shortage of meat in Israel and the relatively high prices obtained for lamb and mutton in recent years have induced sheep farmers to seek ways of increasing the output of these products.

Whereas formerly lambs of the local Awassi breed of sheep used to be disposed of only a few days after birth so as to save their dams' milk for cheese production, it has now become common practice to rear the male lambs for sale to the butcher at an age of not less than two months.

In order to investigate the possibility of establishing pure mutton breeds in Israel, the Ministry of Agriculture imported 20 Texel sheep from the Netherlands in December, 1950, and 140 Suffolk, Romney Marsh and Dorset Horn sheep from Britain in

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June, 1951. This experiment proved a failure, as the animals did not become acclimatised to the high summer temperatures of Israel, and many died from lung diseases. Also the ewes came into oestrus too late in the year — three to four months later than the local Awassi sheep. Most of the lambs were born around April and were still weak and undeveloped when the hot summer set in. It is notable that in the few ewes still alive five years after importation there has been no change in the onset of the oestrual season, save in a single Romney Marsh ewe.

In August, 1953, Dr. D. Goldberg brought 119, and in January, 1955, another 203, Corriedale sheep by air from Australia (Riverina district, New South Wales) to Israel. In Australia in general it is comparatively easy to obtain three lamb crops in two years; but in the Riverina district the ewes are commonly bred between January and April in order to obtain spring lambs. Nearly one-half of the ewes, whether they had arrived in August or in January, lambed in Israel for the first time in May, June and July. Of these late-born lambs, ninety per cent suffered from *Pasteurella pestis* pneumonia, with a seventy per cent mortality. Lambs born in Israel before the end of March do not contract pneumonia. It took half the imported ewes one year, the rest two years, to adapt their oestrual period to Israel conditions, the lambs to be born between December and the middle of March.

In April, 1953, an Argentine company imported 99 Corriedale sheep from the Argentine (Buenos Aires province) into Israel. A second shipment of 138 animals of the same breed followed in December, 1953, and a third shipment, consisting of 193 sheep, in July, 1954. The animals have become acclimatised fairly well, the lambing season of the majority of the ewes having changed from June-August to January-February within two years. But a considerable number of the ewes have remained barren, and the lamb crop raised has been very small.

Of the third shipment of Corriedale sheep from the Argentine, the Faculty of Agriculture of The Hebrew University, Rehovot, in July, 1954, received 10 ewes, and a few months later a male lamb out of one of the ewes of the first Argentine shipment, on loan. From a health point of view the animals have acclimatised very well. Five out of the 10 ewes lambed in August, 1954, and the remaining 5 did not lamb during that year. During the lambing season of 1955, 2 ewes lambed in March, 4 in April, 2 in May, and 1 in June; one did not lamb. During the lambing season of 1956, out of 9 ewes 4 lambed in January, 1 in February, 1 in April; 3 ewes did not lamb during that year. In short, the change-over from August (southern hemisphere) to January-February (northern hemisphere) lambing had been accomplished by half of the ewes within two years.

In August, 1955, the Faculty of Agriculture received 13 pedigree Rambouillet sheep — 2 rams, 8 ewes and 3 lambs — by air from Canada (gift from Mr. H. Veiner, Medicine Hat, Alberta). The ewes came in heat while still at the Lydda Quarantine Station. Six of them lambed in January, 1956, 1 in February and 1 in May. All animals have acclimatised very well and have remained in perfect health and condition.

PROPERTIES OF CORRIEDALE AND RAMBOUILLET SHEEP

The Corriedale sheep has been developed in New Zealand and Australia since 1880 from a cross of Merino ewes and Lincoln and other English Longwool rams. It is a dual-purpose breed—mutton and wool. In mutton conformation it is superior to the Merino but inferior to the Lincoln, and in wool a blend between the fineness and density of the Merino, the length and weight of the Lincoln, and the lustre and elasticity of the Leicester. The Corriedale has proved adaptable to a wide range of pastoral conditions, as varied as those of high mountain regions and arid subtropical environments.

The Rambouillet sheep has been developed in France since 1786. Like the Corriedale it is a dual-purpose sheep, suitable for both wool and mutton production, yielding a fine fleece of good weight and a carcase of desirable mutton. But whereas the Corriedale has been evolved from a cross of Merino and English mutton sheep, the Rambouillet is alleged to be a pure descendant of the Spanish Merino, developed by selection for mutton as well as wool. The Rambouillet is regarded as one of the hardiest and most adaptable breeds of sheep.

EXPERIMENTAL PROCEDURE

The present study is an investigation of the comparative development of Corriedale and Rambouillet lambs in Israel. Only lambs born in January and February were considered. The lambs and their dams were kept on natural pasture in an uprooted orange grove from approximately 8 o'clock in the morning till 3 o'clock in the afternoon. After their return from pasture and throughout the night the animals had free access to drinking water and a salt lick. The principal vegetation of the pasture consisted of the Gramineae *Avena sterilis*, *Bromus* sp., *Phalaris paradoxa*, *and Avena byzantina*, the Leguminosae *Trifolium* sp., *Medicago hispida* and *Tetragonalobus palaestinus*, and *Polygonum equisetiforme*.

The lambs were weighed after birth, and on the 30th, 60th, 90th and 120th day on a full stomach. They were then fasted for 18 hours, weighed empty and slaughtered on the 121st day.

The weights of the following were recorded: Carcase with kidneys, heart, lungs, liver, spleen, testicles, head with tongue and brain, legs and pelt.

The Corriedale ewes were hand-shorn in April, 12 months after the last shearing in Israel; the Rambouillet ewes in May, 10 months after their last shearing in Canada. They were weighed shorn, after all male lambs had been slaughtered and the female lambs weaned

The mean weight of the fleeces of the 5 Corriedale ewes, of 12 months' growth, was 3.840 kilograms, of the fleeces of the 6 Rambouillet ewes, of 10 months' growth, 4.200 kilograms.

RESULTS

The data observed are recorded in the following tables and in Figure 1.

TABLE I

Dates of birth and live weights of male Corriedale lambs, with live weights of dams

Dams		Lambs						
No.	Live wt. (kg)	No.	Birth date	Live weights (kg) At birth	30 days	60 days	90 days	120 days
8	46.50	1	8.1.56	2.75	10.40	16.50	22.80	25.60
3	51.75	2	20.1.56	3.00	10.75	15.50	21.50	25.70
5	51.75	3	31.1.56	4.50	11.25	19.40	24.60	27.00
100	47.00	4	13.2.56	2.50	8.50	15.00	18.20	17.50
Mean wt.	49.250			3.188	10.225	16.600	21.775	23.950
Standard error	1.447			0.449	0.601	0.984	1.350	2.174
Mean wt. increase above previous month's wt. (kg)			Per month		7.037	6.375	5.175	2.175
			Per day		0.235	0.231	0.173	0.073
Mean wt. increase in % of previous month's wt.					221	62	31	10

TABLE II

Dates of birth and live weights of male Rambouillet lambs, with live weights of dams

Dams		Lambs						
No.	Live wt. (kg)	No.	Birth date	Live weights (kg) At birth	30 days	60 days	90 days	120 days
222	54.50	5	10.1.56	4.80	13.30	24.75	36.50	41.25
49	47.25	6	16.1.56	4.50	14.00	25.50	37.00	38.00
79	45.50	7	17.1.56	4.25	13.00	22.50	30.30	34.50
135	56.25	8	28.1.56	4.00	12.50	21.50	29.00	31.20
168	58.75	9	23.2.56	4.75	14.00	23.60	29.40	30.00
Mean wt.	52.45			4.46	13.36	23.57	32.44	34.99
Standard error	2.585			0.151	0.209	0.726	1.774	2.095
Mean wt. increase above previous month's wt. (kg)			Per month		8.900	10.210	8.870	2.550
			Per day		0.297	0.340	0.296	0.085
Mean wt. increase in % of previous month's wt.					200	76	38	8

TABLE III

Dates of birth and live weights of female Corriedale lamb and Rambouillet twins, with live weights of dams

Dams		Lambs						
No.	Live wt. (kg)	No.	Date of birth	Live weights (kg) At birth	30 days	60 days	90 days	120 days
Corriedale 67	58.25	♀10	17.1.56	2.25	9.50	16.75	23.00	24.70
Rambouillet 55	53.25	♂11	29.1.56	2.80	8.50	17.30	22.80	20.00
		♀12	(Twins)	2.40	6.25	14.10	19.30	19.70

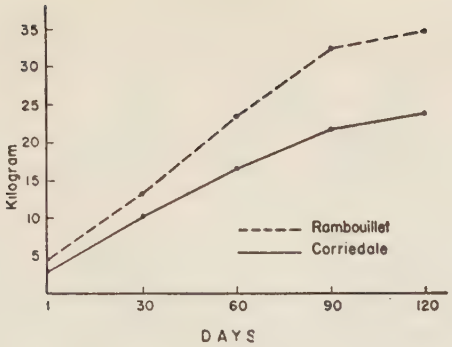

Figure 1

Mean live weights (kg) of male Corriedale and Rambouillet lambs at monthly intervals.

TABLE IV

Live weights of male Corriedale lambs before and after 18 *hours' fasting*

No. of lamb	Live wt. on full stomach (kg)	Live wt. after fasting (kg)	Weight loss kg	Weight loss %
1	25.60	24.20	1.40	5.5
2	25.70	23.40	2.30	8.9
3	27.00	24.10	2.90	10.7
4	17.50	17.00	0.50	2.9
Mean	23.95	22.17	1.77	7.4

TABLE V

Live weights of male Rambouillet lambs before and after 18 *hours' fasting*

No. of lamb	Live wt. on full stomach (kg)	Live wt. after fasting (kg)	Weight loss kg	Weight loss %
5	41.25	37.90	3.35	8.1
6	38.00	35.20	2.80	7.4
7	34.50	31.00	3.50	10.1
8	31.20	28.70	2.50	8.0
9	30.00	27.50	2.50	8.3
Mean	34.99	32.06	2.93	8.4
11 (Twin)	20.00	18.30	1.70	8.5

DISCUSSION

At the United States Experiment Station in Idaho, Corriedale lambs averaged 31.4 kilograms (69 lbs) at weaning time, as compared with 32.3 kilograms (71 lbs) for Rambouillet lambs (Coffey 1937). In the present trial the live weight of male Rambouillet lambs exceeded that of male Corriedale lambs by a very much greater margin, as seen in Table VII.

TABLE VI

Live weight, carcase weight and yield (dressing percentage), and weights of inner organs, head, legs and pelt of male Corriedale and Rambouillet lambs (in kilograms and per cent of live weight)

Breed and No. of lamb	Live wt.	Carcase wt. (incl. kidneys)		Heart		Lungs		Liver		Spleen		Testes		Head		Legs		Pelt	
	kg	kg	% (yield)	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%	kg	%
CORRIEDALE																			
1	24.20	11.30	46.7	0.25	1.0	0.30	1.2	0.30	1.2	0.06	0.2	0.10	0.4	1.00	4.1	0.50	2.1	4.20	17.4
2	23.40	10.20	43.6	0.10	0.4	0.25	1.1	0.35	1.5	0.05	0.2	0.10	0.4	0.95	4.1	0.45	1.9	4.00	17.1
3	24.10	11.50	47.7	0.20	0.8	0.35	1.5	0.35	1.5	0.04	0.2	0.04	0.2	1.05	4.4	0.65	2.7	4.10	17.0
4	17.00	6.70	39.4	0.05	0.3	0.20	1.2	0.25	1.5	0.05	0.3	0.02	0.1	0.80	4.7	0.30	1.8	3.20	18.8
Mean	22.17	9.92	44.8	0.15	0.7	0.27	1.2	0.31	1.4	0.05	0.2	0.06	0.3	0.95	4.3	0.47	2.1	3.87	17.5
Standard error	1.734	1.113		0.046		0.033		0.024		0.004		0.021		0.054		0.072		0.229	
RAMBOUILLET																			
5	37.90	18.10	47.8	0.30	0.8	0.45	1.2	0.65	1.7	0.06	0.2	0.20	0.5	1.60	4.2	0.80	2.1	4.75	12.5
6	35.20	16.90	48.0	0.35	1.0	0.40	1.1	0.55	1.6	0.05	0.1	0.15	0.4	1.45	4.1	0.70	2.0	4.00	11.4
7	31.00	16.00	51.6	0.20	0.6	0.40	1.3	0.45	1.5	0.05	0.2	0.10	0.3	1.20	3.9	0.65	2.1	3.60	11.6
8	28.70	14.90	51.9	0.15	0.5	0.35	1.2	0.50	1.7	0.05	0.2	0.10	0.3	1.25	4.4	0.60	2.1	3.50	12.2
9	27.50	12.10	44.0	0.20	0.7	0.40	1.5	0.40	1.5	0.03	0.1	0.03	0.1	1.60*	5.8	0.60	2.2	2.70	9.8
Mean	32.06	15.60	48.7	0.24	0.7	0.40	1.2	0.51	1.6	0.05	0.1	0.12	0.4	1.42	4.4	0.67	2.1	3.71	11.6
Standard error	1.964	1.021		0.037		0.016		0.043		0.005		0.028		0.085		0.038		0.335	

*Horned

TABLE VII

Excess of mean live weight of male Rambouillet lambs over male Corriedale lambs

	At birth	30 days	60 days	90 days	120 days
Absolute (kg)	1.27	3.13	6.97	10.66	11.04
Relative to mean weight of Corriedale lambs (%)	40	31	42	49	46

At the age of three months the Rambouillet lambs outstripped the Corriedales by more than 10 kilograms, i.e. nearly 50 per cent. At all stages from birth to 120 days, the weight differences between Corriedale and Rambouillet lambs are statistically highly significant.

Regarding the monthly weight increase, this was maintained in both breeds at good levels until the age of three months. But whereas the Corriedale lambs on an average gained less weight from month to month, in the Rambouillet lambs the gain during the second month exceeded that of the first month, while their third month's gain was still equal to that of the first. Gains in weight nearly ceased in both breeds during the fourth month, when the summer heat set in, the pasturage dried up, the milk flow of the dams declined and plant seeds penetrating the skin were irritating the lambs. The effect of these factors was particularly evident in the two lambs born in February and in the Rambouillet twins. In the late-born lambs the carcase, after removal of the pelt, teemed with suppurative wounds caused by the husk-covered seeds of *Avena byzantina*. The slight mean weight increase during the fourth month may have been due to intestinal development in response to the reduced nutritional value of the dry summer pasture and to wool growth, rather than to an increase in muscle and fat.

The mean weight of the dams of the male Rambouillet lambs exceeded that of the Corriedales by 2.200 kilograms. While this difference may or may not have had a bearing on the birth weights and subsequent development of the lambs, it is not characteristic of the two breeds as represented by the small flocks of the Faculty of Agriculture. For if the dam of the female Corriedale lamb and the dam of the Rambouillet twins are included in the comparison, the mean weights of the Corriedale and Rambouillet ewes are practically the same — 51.050 kilograms for the Corriedales and 51.100 kilograms for the Rambouillets.

During the 18 hours' fasting prior to slaughter the male Corriedale lambs lost an average of 1.775 kilograms in weight, the male Rambouillet lambs (excluding the twin) 2.930 kilograms. The slight difference in the percentage of weight loss — 7.4 per cent in the Corriedales as against 8.4 per cent in the Rambouillets, due solely to the emptiness prior to fasting of Corriedale lamb No. 4 — shows weight loss to be correlated with body weight.

The Rambouillet lambs excelled the Corriedale lambs not only in absolute carcase weights but also in a nearly 4 per cent higher yield (the ratio of dressed carcase weight to the live weight of the fasted animal), as seen in Table VIII. This was achieved at the expense of pelt development, demonstrating the principle that for mutton production a light pelt is a desirable quality. While absolute pelt weights were nearly the same in both breeds, in relation to live weight the Rambouillet pelts weighed only about two-thirds of the Corriedale pelts.

TABLE VIII

Excess in absolute weight and yield of carcase and reduction in absolute and relative weight of pelt of male Rambouillet lambs as compared to male Corriedale lambs

	Carcase weight		Pelt weight	
	Absolute (kg)	Yield (%)	Absolute (kg)	Relative (%)
Corriedale	9.93	44.8	3.88	17.5
Rambouillet	15.60	48.7	3.71	11.5
Absolute difference	5.73	3.9	0.17	5.9
Per cent difference	+57.1	+8.7	—4.3	—33.7

The difference in mean carcase weight between the Corriedale and Rambouillet lambs is statistically highly significant, while the difference in dressing percentage (yield) is not significant.

The difference in pelt percentage, i.e. the ratio of pelt to live weight, between the Corriedale and Rambouillet lambs is highly significant.

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SOME FACTORS INFLUENCING THE FORMATION OF TOXIN POISONOUS TO FISH IN BACTERIA-FREE CULTURES OF PRYMNESIUM

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ABSTRACT

An attempt has been made to enhance the formation by *Prymnesium parvum* of toxin poisonous to fish by varying the nutritive solution in bacteria-free cultures.

It is shown that the formation of toxin in low concentrations of sea water is greater than in higher concentrations; e.g. the most toxin was formed in 5% sea water, and the least in 30% concentration, while an intermediate amount was formed in cultures in 10% sea water. The addition of calcium to the culture increased the amount of toxin formed. It is shown also that the toxin is absorbed by the fish.

In order to show its toxicity to fish, bacteria-free cultures of *Prymnesium parvum* were grown (Reich and Kahn 1954). It was found, however, that these cultures had no poisonous effect on fish or only a very slight one.

An attempt was made, therefore, to enhance the formation of toxin by modifying the cultivation methods.

The cultures for the following experiments were grown in dilute synthetic sea water prepared according to Brujewicz (cited in Sverdrup, Johnson and Fleming 1942), with the addition of 0.03% Oxoid Dehydrated Liver Infusion. All solutions had a *p*H of 8.4 and the cultures received light from a 40 watt fluorescent lamp for 14 hours per day, at a temperature of 18°C.

In a preliminary experiment, the influence on toxin formation of the following factors was investigated:

1. *Variation of the salt content.* Although *P. parvum* occurs in the sea (Droop 1954) as well as in brackish water (Conrad 1926, Otterstrom and Steemann-Nielsen 1939, Reich and Aschner 1947), cases of mass mortality of fish have been reported only in brackish water. It could, therefore, be assumed that the salt concentration influences the formation of toxin.
2. *The influence of calcium on toxin formation.* Jariv (1955) found that the toxin *isolated* from *P. parvum* was rendered harmless by dialysis. He found later (personal communication) that by the addition of calcium to the dialysate, the toxic effect was restored. It appeared interesting, therefore, to ascertain whether the toxin formation is influenced by the calcium content of the nutritive medium.

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3. *The influence of phosphate.* Observations in fish ponds seemed to point to the fact that the occurrence and toxic effects of *P. parvum* in these ponds are connected with the fertilization with superphosphate. The influence of the addition of phosphates to the nutritive medium on toxin formation was therefore examined.

As the preliminary experiment showed that the addition of phosphates had no effect, the following experiment was undertaken to investigate only the influence of changes in the salt concentration and the addition of calcium.

For this purpose, three different cultures were prepared: I — in 30% sea water, II — in 10% sea water, III — in 5% sea water. Each culture was made in two series: (a) in synthetic sea water, and (b) in sea water free of calcium. Into series (b) were introduced cultures, which had previously already been raised in calcium-free sea water; but as this solution contained 0.03% liver extract, it was poor in calcium rather than free of it. At the beginning of the experiment, each culture was divided into two parts; one part was examined after the addition of $CaCl_2$, the other after the addition of distilled water.

Identical solutions into which *P. parvum* was not introduced served as controls.

The time required to kill fish of the species *Gambusia affinis* was used to measure the toxin concentration, as was also done in previous experiments (Reich and Aschner 1947, Shilo and Aschner 1953). To compare the results, 18 ml of each culture were put into 50 ml beakers, with the addition of 1 ml of a 0.1 M $NaHCO_3$ solution as a buffer; then, half of the beakers each received 1 ml of 0.2 M $CaCl_2$ solution (as a source of calcium ions), and the other half 1 ml distilled water each. Thus, each beaker contained 20 ml solution into which were put four fishes.

The results of this experiment are summarized in Table I.

The formation of toxin seemed to decrease with increasing salt concentration.

As is evident from this table, the influence of the salt concentration on the effectiveness of the fish toxin of *P. parvum* is very pronounced. In the above experiments, the cultures in 5% sea water were the most toxic, those in 30% sea water the weakest, and those in 10% sea water had intermediate effects. The cultures in calcium-poor sea water (series b) were less toxic than those in sea water with a normal calcium content.

Beakers Nos. 5, 7, 9, 11, 13 and 15, containing 1 ml distilled water instead of 1 ml 0.2 M $CaCl_2$ solution, all showed a uniformly weaker toxic effect. This was particularly noticeable in the experiments with the calcium-poor cultures of series b, in which even the most toxic culture, in the 5% sea water solution, killed only 2 fish within 4 hours. Thus Jariv's observation that the addition of $CaCl_2$ to the dialysed toxin increases the potency of the toxin was confirmed.

In the course of the foregoing experiments, it was observed that the addition of fish reduces the toxicity of cultures. Thus, the dead fish were replaced with live ones in the three most toxic solutions, and the differences shown were found in the times required for the killing of all fish (Table II).

TABLE I

Mortality of Gambusia affinis in different cultures of Prymnesium parvum

Beaker No.	Culture	Sea water concentration %	1 ml 0.2 M $CaCl_2$*	Distilled water*	Number of dead fish, after minutes**														
					15	30	45	60	75	90	105	120	135	150	165	180	195	210	225	240
1	(a) containing	5	—	+	All fish remained alive															
2	calcium		+	—																
3	control: without	30	—	+																
4	*Prymnesium*		+	—																
5		5	—	+								1	2	3	3	3	3	3	3	(4)
6			+	—	3	(4)														
7	(a) containing	10	—	+					1	2	3	3	(4)							
8	calcium		+	—	1	2	(4)													
9		30	—	+													2	2	2	(4)
10			+	—					1	1	1	1	(4)							
11		5	—	+											1	1	2	2	2	2
12			+	—	1	2	(4)													
13	(b) without	10	—	+													1	1	1	1
14	calcium		+	—			1	3	(4)											
15		30	—	+														1	1	1
16			+	—								1	1	1	2	2	2	3	3	3

* 1 ml of the solution was added to 18 ml of the experimental solution; + designates addition, — no addition of the respective solution.

** Figures in brackets denote that all fish in the experimental solution died.

Into beaker No. 6 were introduced, for the third time, four more fish, all of which remained alive. This experiment suggests that the toxin is absorbed from the solution by the fish or by their heavy excretions of mucus.

TABLE II

Times required to kill 4 *Gambusia affinis in two consecutive experiments*

Beaker No.	All fish dead after minutes 1st experiment	2nd experiment	Difference in minutes
6	30	90	+ 60
8	45	150	+105
12	45	over 195	over +150

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LETTERS TO THE EDITOR

Plesiosaur vertebra from the Cenomanian of Ma'ayan Netafim near Eilat. G. Haas, *Department of Zoology, The Hebrew University of Jerusalem.*

Dr. N. Shalem of the Israel Geological Survey was so kind as to present our Department with a fine, well-preserved vertebra of a Plesiosaurian of considerable size, found by him in the Ma'ayan Netafim area near Eilat.

The centrum is almost complete, as are the neural arch and the base of the processus spinosus. Proximal parts of the right praezygapophysis can be distinguished, as well as the base of the fused di- and parapophyses which emerge from the centrum just under the level of the transverse diameter. The postzygapophyses and the processus spinosus are missing, but the base of the right praezygapophysis is preserved. Both bases of the zygapophyses are notched against the dorsal part of the centrum. A small fraction of the preserved anterior slope of the processus spinosus indicates an angle smaller than 90° (about 70°) pointing cranially.

Both terminal surfaces of the centrum are slightly concave with a central ditch of minute size. The upper border of the terminal facet shows a slight emargination.

The fairly ventral position of the transverse process establishes the vertebra as an anterior thoracal one.

The ventral side of the centrum shows a pair of foramina for segmental blood vessels, somewhat closer to the posterior than to the anterior border of the centrum, near the base of the processus transversi. A plug of matrix fills the neural canal completely.

Figure 1
Anterior end of vertebra

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MEASUREMENTS

Antero-posterior length of centrum, taken ventrally:	68.5 mm
Transverse diameter of anterior articular end:	93.0 mm
Transverse diameter of posterior articular end:	95.0 mm
Height of centrum to deepest part of anterior notch:	76.0 mm
Height of centrum to deepest part of posterior notch:	76.0 mm
Distance between (inner borders) ventral vertebral foramina:	38.5 mm

If we try to estimate the length of the whole animal, on the assumption that its proportions conform to those of *Cryptocleidus oxoniensis*, this vertebra would indicate an animal of 5–6 metres total length.

Figure 2
Right side: praezygapophysis at lower border, to the right.

Figure 3
Ventral side of vertebra

Prof. D.M.S. Watson, University College, London, saw the photographs of the vertebra and was of the opinion that it may be ascribed to an Elasmosaurid (the forms with the longest necks among the Plesiosauroidea).

A note on tick chromosomes.* J. KAHN AND B. FELDMAN-MUHSAM, *Department of Parasitology, The Hebrew University of Jerusalem.*

Bonnet (1907), Nordenskiöld (1920), Samson (1909), Warren (1931), Tuzet and Millot (1937) and Stella (1938) described spermatogenesis and oogenesis in Ixodidae. Although all investigators mention the chromosomes, only Tuzet and Millot studied the chromosomal picture in some detail. Recently Dutt (1954) investigated the chromosomes of *Hyalomma aegyptium* and *Rhipicephalus sanguineus*.

Bonnet thinks that there are 5-6 chromosomes in the ovum of *H. aegyptium*, whereas Tuzet and Millot think that the diploid number in *H. aegyptium*** is approximately 12, including a big heterochromosome. According to these authors the big chromosome is absent in *R. bursa*. Stella states that in *R. sanguineus* "the chromosomes are probably 48 in number, grouped in 12 tetrads."

We attempted to study the chromosomal picture of some Ixodidae, for in addition to its genetic interest this type of study may possibly elucidate some obscure systematic problems. Testes and ovaria were studied in acetic-orcein squashes. All ticks examined were laboratory bred.

It was found that in *Hyalomma marginatum* the diploid number of chromosomes is 21 in the male and 22 in the female. The male possesses 20 autosomes and 1 big X chromosome. In the female there are 2 big X chromosomes. The hetero-chromosomes are metacentric, the two arms being unequal. In the second meiotic division there are cells of two types, one with an X and one without an X chromosome.

Hyalomma marginatum, male, mitosis in testis, 1500×.

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* This investigation was supported by Research Grant R. G.-4531 from the National Institutes of Health, U. S. Public Health Service.

** This diagnosis was incorrect, for the ticks studied were taken off cattle, and *H. aegyptium* is not found on Mammalia.

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Ixodes (Ixodoidea, Ixodidae) ticks from Israel, DON R. ARTHUR, *Kings College, London.*

In a recent paper by Feldman-Muhsam (1955) the species of *Ixodes* (Ixodoidea, Ixodidae) reported as occurring in Israel are *Ixodes gibbosus* and *Ixodes theodori* Warburton. At the request of Professor O. Theodor I examined the collections of *Ixodes* ticks of the Parasitology Department of the Hebrew University, as a result of which the ticks quoted below are recorded. They are additions to the fauna of Israel.

Ixodes vespertilionis Koch 1844: 1 nymph, 2 larvae, *Myotis capaccinii*, Rosh Pina, 20. IX. 1946; 1♀, *M. myotis*, Kfar Kana, 25.VI.1947; 1 nymph, 4 larvae, *M. myotis*, Palestine (no exact data), 23. VIII. 1946; 1 nymph, *M. myotis*, Khsas, 7.IV.1947; 1 nymph, *Miniopterus schreibersi*, Palestine, 29.IX.1946.

Ixodes simplex simplex Neumann 1906: 1♀, *Miniopterus schreibersi*, Huti, 28.VIII.1947; 1♀, *Miniopterus schreibersi*, Usbo, 30.V.1947; 1♀, *M. schreibersi*, Rosh Pina, 21.IX.1946;1♀, 1 nymph, *M. schreibersi*, Usbo, 30.V.1947; 2 nymphs, *M. schreibersi*, Usbo, 30.V.1947; 1 larva, *M. schreibersi*, Herzlia, 5.I.1947; 1 nymph, *M. schreibersi*, Palestine, 29.IX.1946; 1 nymph, *M. schreibersi*, Dellata, 25.X.1946; 1 nymph, *M. schreibersi*, Grotte de Pouades, Pyrenées orientales, 17.IV.1946.

Ixodes redikorzevi theodori Warburton 1927: 1♀, *man*, Nahalal, no other data; 1♀, *Spalax ehrenbergi*, Kfar Ivri, XII.1942; 1♀, *Meriones tristrami*, Mishmar Ha'emek, 7.XII.1952; 1♀, *man* Hartuv, 27.XII.1952; 1♀, *Asio flammeus*, Ma'abarot, 20.II.1953; 1♀, *man*, Hadera, II.1955; 1♀, *man*, Petah Tikva, 20.IV.1954; 1♀, *child's* head, Hartuv, 9.II.1956; 2♀♀, *Rallus aquaticus*, Hefziba, 14.I.1956; 4♂♂, in burrow of *Microtus guentheri*, Mishmar Ha'emek, 4.XII.1955.

There is little doubt that the original *Ixodes theodori* is closely allied to *Ixodes redikorzevi* Olenev 1927 and its exact status, as well as a redescription of the female of *I. redikorzevi theodori*, is discussed and described elsewhere (Arthur, 1955).

Description: Male

Length from tips of scapulae to posterior margin of body about 1.55 mm; width 1.0 mm. Broadly ovate, widest a little behind the middle. Brown, with marginal groove and the margins of the ventral plates with a reddish tinge.

Capitulum: Length from tips of palpi to tips of cornua 0.48 mm, greatest width of basis 0.27 mm. Basis narrowed behind, sides nearly straight. Posterior margin between the cornua straight (Figure 3). Surface of basis with a few punctations. Cornua short, pointed. Palpi moderate in length, segment 3 (0.17 mm) slightly longer than segment 2 (0.15 mm). Ventrally posterior margin of basis concave (Figure 4). Transverse ridge broadly rounded, auriculae as blunt lateral saliences slightly elevated above the ventral surface. Palpal segment 1 drawn out into a keel-like projection. Several moderately long fine hairs on ventral edge of palpal segments 2 and 3. Hypostome: Shape as figured (Figure 5). Length about 0.2 mm.

Scutum: Evenly but strongly convex, cervical grooves represented by faint short divergent depressions (Figure 1); pseudoscutum ill defined. Scapulae short and rounded. Lateral carinae absent. Punctations moderately large and deep, set closely together and uniformly distributed, little disparity in size. Hairs numerous, fine and particularly long.

Ventral plates: Median plate about 1.3 times as long as the greatest breadth, and 1.8 times as long as the plate and with moderately-sized, deep depressions, hairs scattered, of moderate length; adanal plates slightly wider in front, postero-lateral margins convex, punctations and hairs much as in ventral plates; punctations and hairs fewer on anal plate.

Legs: Moderate in length and size. All coxae with very fine long hairs (Figure 6). Coxa I with moderately long broad internal spur; external and internal spurs present on all coxae, spurs about equal on coxae II; external spur slightly longer than internal spur on coxae III, but much longer on coxa IV. Tarsus I parallel from proximal end to Haller's organ, narrowing appreciably subapically, length of tarsus I, 0.52 mm, metatarsus I, 0.35 mm; tarsus IV narrowing gently from proximal to distal end, length 0.50 mm, metatarsus IV, 0.36 mm (Figures 7a, 7b).

Spiracular plate: Elongate oval, almost egg-shaped, greatest dimension about 0.46 mm. Longer axis longitudinal (Figure 8).

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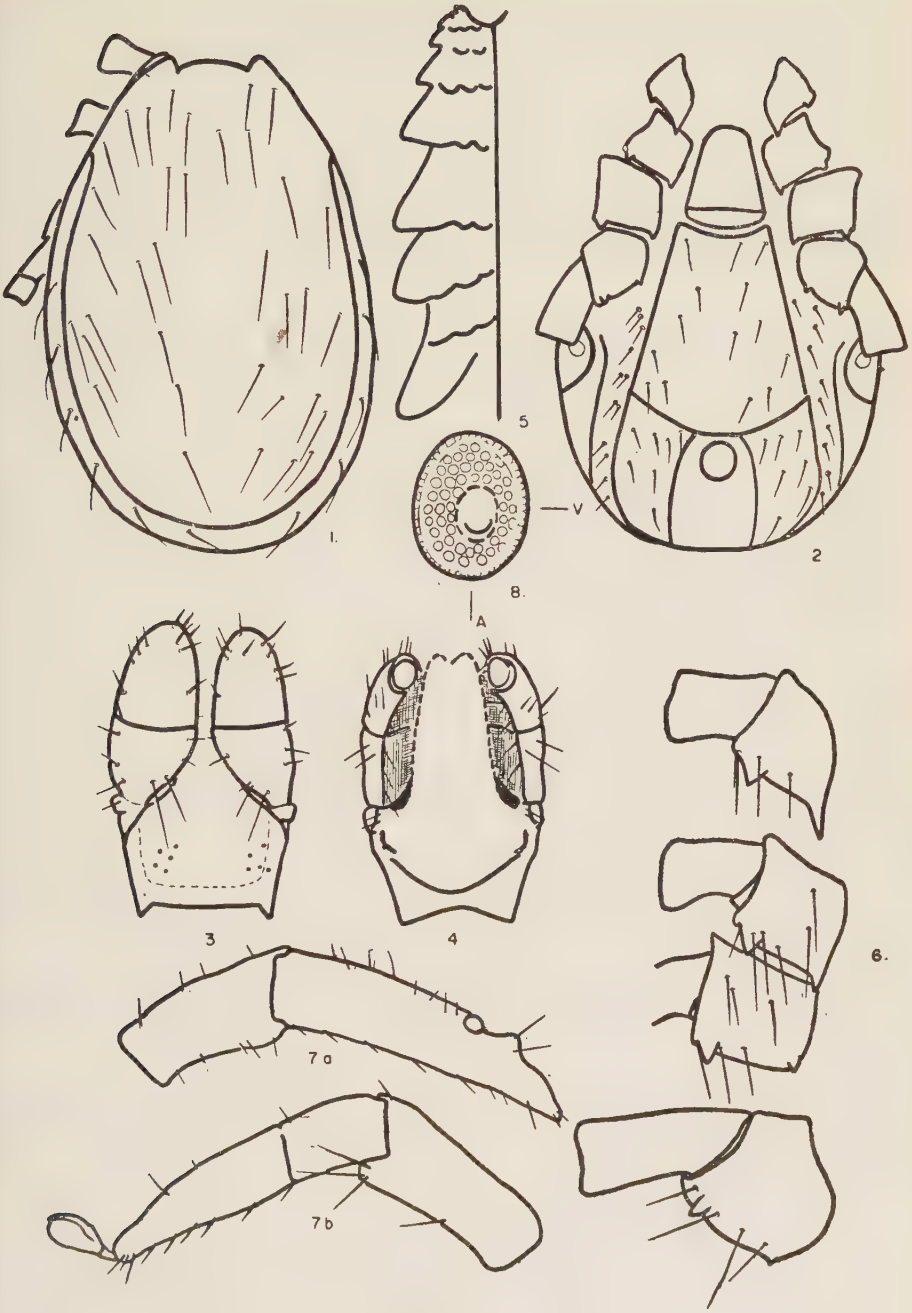

Figures 1–8.
Ixodes redikorzevi theodori Warburton 1927, male.

Genital aperture: Situated at the level of coxae III.

Related species: The males of *I. redikorzevi theodori* are smaller on the average and are also more broadly ovate than the males of *I. redikorzevi redikorzevi*. The legs of the former are longer than in the latter. Probably one of the most characteristic features distinguishing males of these two subspecies is the length of the body hairs, those of *I. r. theodori* being nearly twice as long as those of *I. r. redikorzevi*.

Ixodes passericola Schulze: 2♀♀, 2♂♂, 1 nymph, from nest of *Petronia petronia*, Jerusalem, 1.VI.1954.

Ixodes **kaiseri** sp. nov. This new species was originally described from specimens collected from the common Egyptian fox, *Vulpes vulpes aegyptiaca*, Burg el Arab, Mariut, Western Desert Governate, Egypt. This species has since been collected from the following hosts in Israel: 2♀♀, 1 nymph, *Meles meles*, Tivon, 17.I.1956; 1 nymph, 5 larvae, *Vulpes vulpes*, Yassur, 15.I.1956.

SUMMARY

Records of the bat ticks, *I. vespertilionis* Koch and *I. simplex simplex* Neumann, of the tick *I. passericola* Schulze, of *I. redikorzevi theodori* Warburton and *I. kaiseri* Arthur from Israel are quoted. The male of *I. redikorzevi theodori* is described for the first time from the nest of *Microtus guentheri*.

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The thiamine requirements of *Prymnesium parvum* (Chrysomonadina). M. Rotberg, *Department of Zoology, The Hebrew University of Jerusalem.*

It has been shown by Droop[1] that *Prymnesium parvum* (Carter) isolated from brackish supra-littoral pools has an absolute requirement for B_{12}, whereas thiamine has apparently only the function of a stimulating substance in this strain. In his review on auxotrophy in marine plankton, Droop[2] stated further that an absolute requirement for thiamine has not yet been established for any marine phytoplankton.

In Israel, *Prymnesium parvum* occurs in fish ponds of brackish water and due to its toxicity to fish[3] is of considerable economic importance. In view of this the auxotrophy of a strain isolated from such ponds by Reich and Kahn[4] is under extensive investigation in our Department.

The experiments reported here were carried out in a basic medium containing 30% synthetic sea water, with additional $NaNO_3$ and KH_2PO_4 and 1 mg/ml vitamin free casamino-acids (Difco). The results of our experiments corroborate Droop's findings on the point concerning B_{12} only. Contrary to his claims it has been found that thiamine is an essential requirement for growth of *Prymnesium parvum* in axenic cultures.

On repeated transfers of the flagellate in thiamine-free media, cell division ceased and eventually the organism disappeared from the culture.

The quantitative requirements for thiamine within the range of 0.01–10 mγ/ml are shown in Figure 1, from which it can also be seen that a concentration of thiamine above 10 mγ/ml inhibits the growth of our strain of *Prymnesium*.

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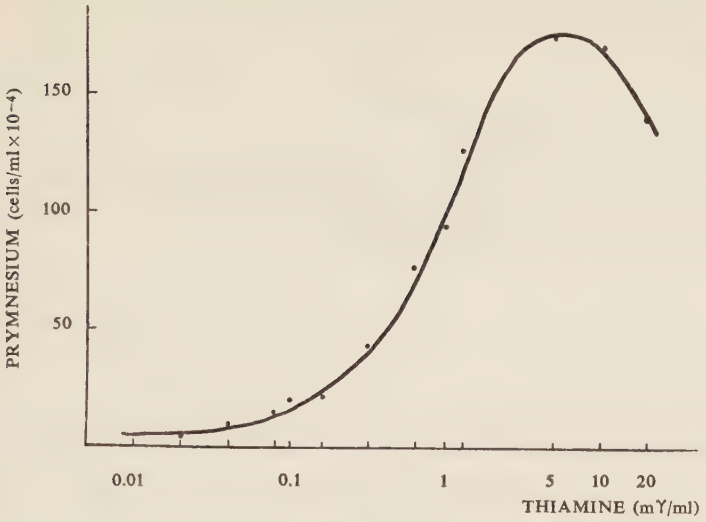

Figure 1.

Number of cells/ml of *Prymnesium parvum* at various concentrations of thiamine.

In further experiments it was found that thiamine can be successfully substituted for by pyrimidine plus thiazole, or by pyrimidine alone, but not by thiazole alone. However, the addition of whole thiamine results in better growth (Table I). In cultures containing pyrimidine plus thiazole, each in the amount equal to the optimal concentration of thiamine, the maximum of growth attained was low (Table I, No. 4). The apparent retardation of growth could be explained as due to the fact that on an equimolar basis the amount of pyrimidine plus thiazole exceeded the optimal concentration of thiamine.

TABLE I

Number of cells/ml of Prymnesium parvum in cultures containing thiamine or its compounds

No. of culture	Thiamine mγ/ml	Pyrimidine mγ/ml	Thiazole mγ/ml	No. of cells/ml
1	10	—	—	1,840,000
2	—	10	—	920,000
3	—	—	10	4,000
4	—	10	10	700,000

Additional experiments performed with vitamins of the B-group showed that this strain of *Prymnesium* does not require other vitamins.

The findings suggest that the two strains of *Prymnesium*, one isolated by Droop and the other by Reich and Kahn, differ in their vitamin requirements; or else Droop's medium contained one part of the thiamine compound, which enabled the flagellate to synthesize the missing thiamine.

In 1953 Hall[5] arranged a list of various flagellates according to their requirements for thiamine, pyrimidine and thiazole. On the basis of our findings *Prymnesium parvum* may now be added to the group of those flagellates which grow on pyrimidine alone.

I wish to thank Prof. K. Reich for help and guidance in this work.

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PROCEEDINGS OF THE FOURTH MEETING OF THE ISRAEL GENETICS CIRCLE

Held at Jerusalem, December 17, 1957

Dedicated to

HUMAN GENETICS

CONTENTS

Morning session

Chairman: Prof. F. Dreyfuss

Afternoon session

Round Table Conference on

"Resemblance and Difference between Jewish Communities."

Gaucher's disease among the Jews of Israel. K. FRIED, *The Hebrew University–Hadassah Medica School, Jerusalem.*

Gaucher's disease was first described in 1882 in a thesis presented to the Faculty of Medicine in Paris by Phillip Charles Gaucher. In 1900 Bovaird called attention to the familial occurrence of the disease. Meanwhile it had been observed among the coloured as well as among the white races, and it is known to be especially frequent among Jews. By 1953, some 250 cases had been described in the literature.

In the medical files of the Hadassah Hospital in Jerusalem from 1940 till the present date, there were 19 cases in which the diagnosis of Gaucher's disease was certain. One further case is known to us which does not appear in the files. All these cases belong to the Chronic Adult Type, and they are equally divided among males and females. All the patients are of the Ashkenazic community. On the basis of these data we endeavoured to calculate the minimum prevalence of the chronic type of Gaucher's disease within the Ashkenazic community in Jerusalem. Although the calculation is probably incomplete it may be assumed that the majority of the patients living at present in Jerusalem is known to us. In 1957, we knew of 8 patients suffering from Gaucher's disease and living in Jerusalem. All of them belong to the Ashkenazic community, and none is related to the others.

The total population of Jerusalem (according to an estimate of the Central Bureau of Statistics) in 1957 amounted to 148,000, of which 62,000 (or approximately 42 per cent) belonged to the Ashkenazic community. Consequently the incidence within the Ashkenazic community is 8/62,000, or approximately 1/8.000.

It may be assumed that more or less equal diagnostic possibilities with regard to Gaucher's disease exist in all communities. If the disease was equally frequent among all communities the chances of all 8 cases being concentrated among Ashkenazim would be less than one-half of one percent. The deviation from random distribution among the communities is therefore significant. The difference in the representation of various age groups in the communities cannot be responsible for so large a deviation.

This is the first attempt to calculate the prevalence of Gaucher's disease in any community.

It may be concluded that Gaucher's disease is relatively frequent within the Ashkenazic community, while it is rare in other Jewish communities.

The author wishes to thank Prof. E. Goldschmidt, Department of Zoology, and Dr. Y. Matoth, Rothschild–Hadassah–University Hospital, for their help and advice.

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ABO blood groups in ulcerative and malignant gastro-intestinal diseases. D. BIRNBAUM AND J. MENCZEL, *Department of Medicine A, Rothschild–Hadassah–University Hospital, Jerusalem.*

Following the report of Aird *et al.*[1] on a significantly higher incidence of blood group A in British patients suffering from stomach cancer, these findings were confirmed for Denmark, Switzerland, South America and other countries.

In 1954 Aird *et al.*[2] reported a greater incidence of blood group O among 3011 patients with peptic ulcer. Clarke *et al.*[3] confirmed this finding for duodenal ulcer but not for gastric ulcer. Additional studies in sibships suffering from duodenal ulcer[4], where unaffected sibs served as controls, did not support the hypothesis that a group O individual is more likely to develop a duodenal ulcer than are A, B or AB sibs. Since the possibility of ethnic variations in the relation between blood-groups and diseases has often been raised, we were led to investigate the blood group distribution in ulcerative and malignant gastrointestinal diseases in patients admitted to the Rothschild–Hadassah–University Hospital. The blood group distribution found in patients of various ethnic groups was compared with data reported by Gurevetch *et al.*[5] for the Ashkenazic, Sephardic and Oriental communities.

This study is based on data obtained from 552 patients, including 258 suffering from duodenal ulcer, 40 from ulcerative colitis, 134 from cancer of the stomach and 120 from cancer of the colon and rectosigmoid.

RESULTS

Table I summarizes the blood group distribution in 258 patients with duodenal ulcers.

TABLE I

Blood group distribution in duodenal ulcer in percentages

Patients	Blood groups O (%)	A (%)	B (%)	AB (%)
Ashkenazim				
158 patients with duodenal ulcer	46.2	34.2	14.5	5.1
946 controls[5]	38.3	41.2	14.4	6.1
Sephardim				
42 patients with duodenal ulcer	38.1	23.8	33.3	4.8
252 controls[5]	40.5	32.3	18.6	8.6
Orientals				
58 patients with duodenal ulcer	48.2	29.3	15.6	6.9
137 controls[5]	36.5	33.4	19.5	10.6

The increased frequency of blood group O, + 7.5% (Ashkenazim), + 11.7% (Orientals), and the decrease, –2.4% (Sephardim), are not significant.

In 40 cases of ulcerative colitis no deviation larger than 4% was observed in any of the blood groups.

It is of interest to compare the incidence of gastric and colonic cancer cases in the various communities as reflected by their hospitalization in the largest Jerusalem hospital (Table II). These data indicate a low incidence in the non-Ashkenazic communities, which totaled 40–60% of the population in Jerusalem during the last 5 year observation period. For the full evaluation of these data a correction for the representation of different age groups in the communities would be required.

TABLE II

Incidence of gastrointestinal cancer in 254patients of various communities admitted, to the Rotschschild–Hadassah–University Hospital

Patients	Ashkenazim Cases	%	Sephardim Cases	%	Orientals Cases	%
134 patients with cancer of stomach	112	83.5	10	7.4	12	9.1
120 patients with cancer of colon	96	80.0	8	6.7	16	13.3

The blood group distribution among Ashkenazim suffering from cancer (Table III) shows a *decreased* incidence of cancer of the stomach in blood group A and an increased incidence in group B (+ 7%) which are statistically non-significant.

In agreement with other reports, no significant deviation was found in cancer of the colon and rectosigmoid. Although our method does not conform to the most stringent demand since we have not utilized sib-controls, our classification of the Jerusalem patients according to ethnic affiliation is probably more satisfactory than the pooling of the populations of large European cities. Thus although our data are based on small groups, it may be of interest that we found no significant excess of any single blood group in benign or malignant disease of the intestinal tract.

TABLE III

Blood group distribution in gastric and colonic cancer in percentages

Ashkenazim

Patients	O (%)	A (%)	B (%)	AB (%)
112 patients with cancer of stomach	38.4	33.0	21.4	7.2
96 patients with cancer of colon	36.4	39.6	16.7	7.3
964 controls[5]	38.3	41.2	14.4	6.1

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Thalassemia in Jews from Kurdistan. Y. Matoth and J. Pinhas, *Rothschild-Hadassah-University Hospital, Jerusalem.*

A high incidence of thalassemia has been found among Jews from Kurdistan. Over a 5 year period 11 new cases of thalassemia major, representing the homozygous state, have been diagnosed among children of the Kurdish community in the Jerusalem area. This community numbers about 11,000 with an estimated birth rate of 500. The incidence of thalassemia major is therefore estimated at 1 in 227 births. From this figure a frequency of 0.066 for the thalassemia gene and of 0.123 for the heterozygous state has been calculated.

An outline of the clinical and haematological features of thalassemia is given. The literature concerning its mode of transmission is reviewed. The geographical distribution in thalassemia and its occurrence among various ethnic groups in Israel is discussed.

Haemolytic trait in non-Ashkenazic Jews: inherited enzymatic abnormality of erythrocytes. Ch. Sheba, A. Szeinberg and A. Adam, *Government Hospital Tel-Hashomer.*

Haemolytic reactions due to *Vicia faba*, sulpha drugs and other agents are restricted among, the Jews of Israel to the non-Ashkenazic communities. Erythrocytes of subjects who suffered in the past from such reactions showed several abnormalities, namely low glutathione concentration, glutathione instability and defective glucose-6-phosphate dehydrogenase activity.

In a survey of 288 randomly selected Ashkenazic Jews, no such abnormalities were found, while a group of 279 non-Ashkenazic Jews contained about 11% of persons possessing such defective erythrocytes. The abnormality was most frequent among subjects originating from Iraq (about 20%); in other groups studied (Yemenites or immigrants from North Africa) the frequency was about 5%.

Genetic investigations indicate that the abnormal trait is probably inherited as a sex-linked dominant, with variable expressivity.

Bronchial asthma in Jews from Iraq after their immigration to Israel. M. J. Gutmann, *Jerusalem.*

Although bronchial asthma occurred among Jews in Iraq, it did not constitute a problem of importance. It did not differ from the usual pattern as regards heredity, previous history, onset, age and course of the disease.

During 1951/52, approximately 124,000 Jews from Iraq immigrated into Israel, in entire families without selection. From Baghdad alone came 90,000. There the climate is dry and hot in summer, dry and cold in winter. In summer, most people sleep on the roofs in the open. Intermarriage between cousins was very common[1].

In 1953, Somakh[2] reported that "not a single family of these newcomers is devoid of a case of asthma or allergic rhinitis."

This was a challenge of extraordinary importance and we immediately started systematic investigations. These studies confirmed that a considerable proportion of immigrants from Iraq (previously reported healthy) had come down with bronchial asthma within a relatively short period (1–2 years) after immigration, whereas other immigrants living under similar conditions were comparatively free from asthma.

But these asthmatics differed in many respects from the usual pattern:

1. Asthma suddenly appeared as an "epidemic"; this always points towards an environmental factor (Ancona[3], Gutmann[4], Ordman[5]).

2. Most of these asthmatics lived in a well-defined area, around Tel Aviv-Jaffa-Ramat Gan, whereas in other places, even in the climatically similar coastal plain, the incidence of the disease in the Iraq Community was extremely small.

3. Generally, asthma runs in families: among 296 families of the general population we found asthma in only 76 families (25.7%), whereas 74.3% were free from asthma. The incidence in the group under investigation appeared to be much higher.

4. The age composition of this group was very unusual: no children below 10 were affected, as compared with 27.8% among the other asthmatics; the majority of the affected were young people between 20–30 (–40) years.

5. The family and case histories seldom revealed allergic diseases, but the statements were, of course, not completely reliable. Most of the affected persons claimed to have been completely healthy before their immigration and to belong to a completely healthy family.

6. The onset of the disease occurred about one to two years after immigration, a short time for sensitization to fungi, which were the main causative allergen. There were no cases of pollen-allergy which have a longer sensitization time.

This is not the usual hereditary type of bronchial asthma, but rather an "acquired-grafted" allergic disease.

The following explanation for the high incidence of asthma in this special group is offered: The majority (about 90,000) of the immigrants came from Baghdad, the largest city in Iraq, and settled in and around Tel-Aviv, the largest city in Israel, where they expected to find suitable living conditions. Psychologically, they were not prepared to be pioneers to the extent of changing their mode of life or their occupations. It is interesting that the working class of this community, accustomed to manual labour, adapted themselves easily.

Today, after several years of adaptation to the new environment, the incidence and age distribution of asthma among immigrants from Iraq appears to resemble that of the general population.

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Morquio's disease in two families. E. MARGOLIS, *Out-patient Department 'C', Genetic Counselling Clinic, Rothschild-Hadassah-University Hospital, Jerusalem.*

Two families, the first from Iraq, the second from Turkey, both affected with the rare Morquio's disease, are reported. No direct data concerning family "A" could be obtained, as the parents abandoned their crippled daughter and left her with her grandparents. Of this pedigree only the normal maternal grandparents and the propositus could be examined. According to their evidence the parents are normal and probably relatives. The propositus revealed the full clinical and X-ray picture of Morquio's disease. She also had strabism and appeared mentally younger than her age, which was 12 years.

Family "B" could be better studied. The parents are relatives, the husband being the uncle of his wife. Their eldest son, aged 25 years, and their youngest, aged 10 years, are affected with Morquio's disease, while the second son (about 20 years) is normal. Both affected offspring are deaf, examination in the E.N.T. Department showing this to be bilateral conductive and perceptive deafness. Corneal opacities were found in both affected sibs, but no other signs characteristic of the related gargoylism, e.g. infantilism and mental retardation, pot-belly with hepatomegaly and splenomegaly, misshapen head with hydrocephalus or hypertelorism, were detected.

The skeletal deformities, as revealed in the X-ray films of our patients, were in accord with the criteria of Caffey[1], namely dwarfism, normal head, short neck and trunk, shortened extremities, knock-knees, irregular and hypoplastic caput femoris, kyphotic spine with distinct flattening of the vertebral bodies.

Morquio[2,3] stressed the fact that the intelligence in his cases was normal. Nevertheless, cases are recorded[4,5,6,7] to show that mental retardation is frequently encountered in Morquio's disease. In our patients, as might be the case also in other instances, the mental retardation seemed to be more socially than biologically conditioned.

It is generally accepted that Morquio's disease is often transmitted as an autosomal recessive and occasionally as a sex-linked recessive trait.

In family "A" the birth of an affected daughter of normal parents testifies against sex-linked inheritance; in family "B" sex-linked transmission cannot be excluded, but the close relationship between the parents increases the likelihood of autosomal recessive inheritance.

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Achondroplasia observed in two generations. E. N. EHRENFELD, E. PORATH AND A. BRZEZINSKI, *Rothschild-Hadassah-University Hospital, Jerusalem.*

Typical achondroplasia is an uncommon condition. Infants affected by this anomaly show a high mortality during the first few months of life. In a large series of 60,000 deliveries at the Chicago Lying-in Hospital there was only 1 survivor out of 8 typical achondroplastic children. At the Rothschild–Hadassah–University Hospital, out of 26,309 deliveries in the past 15 years, 4 achondroplastic children were born, of whom only one survived. It is generally agreed that this pathological entity is often caused by genetic factors. Affected offspring of healthy parents are assumed to have inherited a "mutated" gene, which will be passed on as a Mendelian dominant to 50% of their own children. However, the possibility of the sporadic occurrence of achondroplasia as a non-inherited "phenocopy' has to be taken into account.

Two achondroplastic infants are reported, born to parents who themselves were achondroplastic dwarfs. The first infant was delivered alive by Caesarean section at another hospital early in the 7th month of pregnancy but expired 35 minutes after birth. The second pregnancy was successfully

terminated—also by Caesarean section—when the patient went into labour in the 36th week of pregnancy. The proportions of both infants were in keeping with the presence of chondrodystrophy, which was proved by X-ray examination in the second case.

The low survival rate of infants affected by this abnormality has been explained as due to abnormal bone proliferation in the region of the occipital foramen (causing spine compression), to pulmonary hypoplasia secondary to chest deformity and, in cases born to mothers affected by the same disease, to prematurity. According to Morch, 108 chondrodystrophic dwarfs produced altogether 27 children, of whom 10 were chondrodystrophic. One of the reasons for the low incidence of chondrodystrophic children born to 2 affected parents may be abortion in early pregnancy of the (possibly unviable) homozygous fetus. The reduced fertility of chondrodystrophic subjects and the reduced viabilities of the affected homozygotes and heterozygotes account for the fact that the number of dwarfs presumed to have arisen from new mutations is about four times as high as the number born to affected parents.

The rate of appearance of new chondrodystrophics in the population of Israel, calculated on the basis of our figures, is in excellent agreement with the rate reported for other countries.

Comments on ethnic differences in the incidence of infantile pyloric stenosis. Z. LARON, *Pediatric Metabolic Service, Beilinson Hospital, Petah-Tikva*, R. FALK, *Department of Zoology, The Hebrew University of Jerusalem.*

It was observed in the beginning of this century that the incidence of infantile pyloric stenosis is increased in certain families. Cockayne and Penrose[1] who investigated this problem suggested that a recessive gene may be involved in the causation of the disease. However, the higher incidence in males and in the first born babies and the finding that sometimes only one of monozygotic twins may be affected, indicate the role of non-genetic factors in the causation of infantile pyloric stenosis. The aetiology of the disease is thus far from clear.

Investigations in different countries demonstrated that the incidence of infantile pyloric stenosis differs in various populations. This is shown in the following table (modified from Laron and Horne[2]).

Country	Incidence of infantile pyloric stenosis (Per cent of live births)	(Per no. of live births)
Sweden	0.4	1:250
England	0.3	1:333
U.S.A., White	0.13	1:770
U.S.A., Negro	0.05	1:2000
Israel	0.05	1:2000

From this table it is evident that the incidence of infantile pyloric stenosis among Jews is similar to that in Negroes and lower than that of the white people in Europe and the United States. Reviewing the literature one gets the impression that the disease is rarely seen among the populations of Asia.

We analysed the data from Israel for the period from 1949 to 1953, considering on one hand the distribution of live births according to the country of origin of the mothers, and on the other hand the incidence of infantile pyloric stenosis among the different Jewish communities. The findings shown in the table below indicate that the disease is much more frequent among the Ashkenazic Jews than in the other communities, this difference being statistically highly significant ($P = 0.001$). The data reveal no difference in the incidence of infantile pyloric stenosis between the non-Ashkenazic communities.

Community	No. of cases	Incidence of pyloric stenosis (Per cent of live births)
Ashkenazic	78	0.07
Sephardic	10	0.02
Oriental	5	0.02
Yemenite	3	0.02

There are two factors which might reduce the difference in the true incidence of infantile pyloric stenosis between Ashkenazic and non-Ashkenazic Jews:

a) The number of first-born babies among total live births is smaller in non-Ashkenazic communities, where families are larger on the average.

b) It is possible that among non-Ashkenazic Jews more babies with infantile pyloric stenosis escaped medical attention.

Further studies to clarify the incidence of infantile pyloric stenosis among the different Jewish communities in Israel are planned.

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Mating systems in the Jewish community of Iraq. E. GOLDSCHMIDT, A. RONEN, I. RONEN AND S. MERIN, *Department of Zoology, The Hebrew University of Jerusalem.*

A survey on consanguinity among the parents of new-born babies in this country indicates that Jews from Iraq have a pronounced tendency to choose their mates among their relatives. Among 617 couples of whom both partners originated from Iraq there were seven cases of uncle-niece marriage and 116 matings between first cousins ($18.8 \pm 1.6\%$). These include 23 cases, in which the consanguinity between the couple was actually closer than that of first cousins (double first cousins or first cousins and first cousins once removed, etc.). When the more distant grades of consanguinity are included, the total rate among the fertile matings of the present generation amounts to $30.8 \pm 1.9\%$

In England cousin marriages occur most frequently between the children of two sisters. The Iraq community shows a predilection for matings between the children of two brothers or of two sisters, while the children of a brother and a sister marry more rarely ($P < 0.01$).

When comparing marriages contracted in Iraq with those concluded in Israel we find that the new conditions have already brought about a considerable change in the mating system of this group. Among 460 persons married in Iraq, 102 or $22.2 \pm 1.9\%$ married a first cousin. Among 931 persons married in Israel, only 130 or $14.0 \pm 1.1\%$ chose a first cousin, 544 an unrelated partner from Iraq, and 102 married a member of a different community. In an additional 55 cases the other partner was born in Israel and a large percentage of these unions are also inter-community marriages.

An attempt to calculate the size of the Jewish isolates in Iraq by Dahlberg's formula, assuming that 5 children of the average family reached maturity, yields an absurdly low estimate (180). This calculation lends support to the assumption that consanguineous unions were not randomly contracted in this community, but were in fact preferred to non-consanguineous marriages.

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Round Table Conference

RESEMBLANCE AND DIFFERENCE BETWEEN JEWISH COMMUNITIES

Blood groups in Sephardic Jews. J. GUREVITCH AND D. HERMONI, *Dept. of Clinical Microbiology, The Hebrew University–Hadassah Medical School, Jerusalem*, and E. MARGOLIS, *Out-patient Dept. "C", Rothschild–Hadassah–University Hospital, Jerusalem.*

The ABO, MN and Rh-Hr blood group frequencies in 200 Sephardic Jews from the Balkan states are reported and discussed. The results are compared with findings on blood group frequencies in Jews from Morocco and Tunisia[1].

A rather high A percentage of 45% and a somewhat low O frequency of 29% has been found in this group, as compared with Jews from Morocco and Tunisia.

The M and N genes show similar frequencies in all three communities. The Sephardic Jews exhibit an interesting though unexplained phenomenon of "heterosis," the phenotype MN 70% far exceeding the expected 50%.

The distribution of the Rh-Hr chromosomes indicates African and Spanish influx. The three communities exhibit a typically Mediterranean high level of CDe. This chromosome is frequent also among other Jewish communities[2].

The cDe chromosome, the so-called African character[3], was found in 11% of the examined group. The North European chromosome, cDE, is present in 8.6%.

Only 7% of Rh negatives were found in this sample.

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Remarks on the history of gene flow into Jewish groups. Joshua O. Leibowitz, *Jerusalem.*

The clinician in Israel is confronted with striking differences between the various communities regarding the incidence of certain inherited diseases (Tay-Sachs, favism, Cooley's anaemia), some of which have been commented upon at the present meeting.

These differences as well as certain characteristics in blood group frequencies appear to indicate that some admixture of foreign genes must have taken place at various periods in the history of the Jewish communities.

What is the historical evidence for the occurrence of such gene flow? The Biblical accounts testify to many possibilities, though the more ancient records date from periods before the ethnical formation of the nation. Zipporah, Moses' wife, was the daughter of a priest of Midian. Promiscuity with the daughters of Moab and Midian, during the desert migration, aroused the zealotry of Phineas. The case of the captive gentile woman in Deuteronomy, chapter 21, was concluded by the legal permission to marry her. The wives of King Solomon were women of the Moabites, Ammonites, Edomites, Zidonians, and Hittites (I Kings, 11), "of the nations concerning which the Lord said unto the children of Israel, ye shall not go in to them." The Moabite Ruth leads the pedigree of King David himself.

The interesting story of a Jewish military colony at Yeb (Elephantine) in Upper Egypt has been revealed in the famous Aramaic papyri, part of them published as late as 1953. Papyrus 5 mentions Meshullam bar Zakkur who released his handmaiden Tpmt, an Egyptian, and her daughter Yehoyishma whom she had born him. A similar Jewish-Egyptian marriage is described in Papyrus 2: "She will be my wife and I her husband from this day for ever." The point is that the deed is a legal marriage into a Jewish esoteric group.

More significant is the role played by proselytes (*Gerim*). According to Philo (Contra Apionem II, 39), a strong tendency to adopt Judaism existed among the Greek and barbarian populations. Many high-born persons of Talmudic times were proselytes, as for instance Queen Helen and her sons. Others were the Herodians and Onkelos. The *Gere Zedek* are mentioned in the prayer of *Shemoneh-Esreh*. The Talmud refers very often to the "Gerim;" the great Talmudic Encyclopedia (1750–1887) by Isaac Lampronti contains no less than 66 references under this heading.

The Halakah, as formulated by Maimonides (Hilkot Issurei Biah, 15: 3) teaches: "A gentile or a slave who has a child by a daughter of Israel—the newborn is *kasher*" (i.e. Jewish).

The massacres of 1096 (Crusades) and 1648 (Chmielnicki) entailed mass violations of Jewish women. The offspring became acknowledged as full Jews according to Rabbinical rule.

The genetics of Jewish populations. Finger print patterns in Jewish populations in Israel. L. Sachs, *The Weizmann Institute of Science, Rehovot,* and M. Bat-Miriam, *The Israel Institute for Biological Research, Ness-Ziona.*

The paper appeared in full in: *Am. J. Human Gen.*, **9**, 117–126, 1957.

Concluding remarks. ELISABETH GOLDSCHMIDT, *Department of Zoology, The Hebrew University of Jerusalem.*

While only the afternoon session of this meeting was planned to deal with the similarities and the differences between the Jewish communities, it is no coincidence that most of the morning papers contributed to the same subject. It is gratifying that so many workers have been independently attracted by different aspects of the same problem, whose central position in Israel Human Genetics needs no further comment.

The speakers of the morning session drew attention to numerous differences in the incidence of inherited disease between the various communities. Gaucher's and Tay-Sachs' disease, pyloric stenosis and cancer of stomach and rectum appear to be more frequent among Ashkenazim, while Jews from Iraq have a high incidence of haemolytic trait and the Kurdish community has a considerable concentration of thalassemia. At the afternoon session it was repeatedly stressed that the Jewish communities must possess a certain measure of common inheritance. Although Leibowitz quoted numerous instances of admixture of foreign genes, he also hinted that many of these cases were considered exceptions—the objects of extensive deliberations among rabbinical authorities.

It should be realized that *gene admixture* is only one of the factors which may have contributed to the genetic differentiation of the various Jewish tribes. The *selective influence* of different environments and modes of life and *genetic drift*, the chance survival and chance extinction of certain genes in small isolates, should certainly not be ignored.

The extensive blood group data collected by Gurevitch[1] and his collaborators indicate pronounced differences between the communities. Table I presents a series of Jewish and gentile Rh group

TABLE I

Frequencies (%) of the commoner Rh chromosomes in some Jewish and gentile populations (because of the omission of the rarer chromosomes Cde and cdE percentages do not add up to 100)

	CDe	*cDE*	*cDe*	*cde*
Swedes	41.6	15.9	1.8	38.5
Dutch (Australia)	43.1	16.1	1.8	37.0
Ashkenazic Jews*	45.1	12.7	4.6	36.0
Italians (Bari)	49.2	12.0	4.7	32.0
Greeks	45.1	7.3	5.6	35.4
Kurdistan Jews*	53.0	17.9	5.1	15.0
Iraqi Jews*	53.5	15.8	4.1	19.8
Asiatic Indians	57.3	9.3	3.3	25.5
Yemenite Jews*	56.1	7.9	6.4	28.2
Cochin Jews*	41.5	5.0	6.2	44.4
Basques	39.0	5.9	7.5	45.6

* Based on Gurevitch *et al.*[1] and earlier publications. Other data from Mourant[2].

frequencies selected to illustrate the wide range of variation among Jews. Further work, utilizing anti-D^u serum, may well tend to accentuate rather than to reduce these discrepancies. The Rh factors were chosen because they have lately been considered to be less dependent on selective influences than the ABO system. It is extremely difficult to reconcile the blood group data with the fingerprint evidence of Sachs and Bat-Miriam[3] indicating a much closer genetic similarity between the Jewish communities.

Fingerprint patterns are claimed today to be selectively neutral, just as blood groups were only a few years ago. Further work to test this assumption is certainly required. On the other hand, it may be an important point that finger print patterns depend on polygenic inheritance, whereas blood group polymorphism is determined by major genes. Indeed, the work on animal populations (Stalker and Carson 1948)[4] has furnished some indications that polygenic and polymorphic systems

may show, to some extent, independent variation. There is, however, little evidence that polygenic systems are generally characterized by greater evolutionary stability.

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